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HANDBOOK OF SUPERSONIC AERODYNAMICS

Compiled and edited under Bureau of Ordnance Contract NOrd 7386 by the Aerodynamics Handbook Staff of The Johns Hopkins University, Applied Physics Laboratory, Silver Spring, Maryland. The selection and technical review of the material appearing in this section of Volume 5 of the Handbook were functions of a Reviewing Committee appointed by the Director of the Laboratory. The membership of this Committee during the preparation of this section was as follows: C. N. Warfield (Chairman), L. L. Cronvich, A. R. Eaton, Jr., G. M. Edelman, and F. K. Hill.

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HANDBOOK OF SUPERSONIC AERODYNAMICS

Volume 5

Section 15

Preface

A general preface to the entire Handbook of Supersonic Aerodynamics appears in Volume 1. It includes a brief history of the project and an indication of the organizational arrangements for activities pertaining to this Handbook. In the winter of 1952-1953 important decisions were made affecting these arrangements. Since this present section (Section 15) of the Handbook was prepared principally during the period preceding these recent decisions, the preface and title page of this issue do not reflect these decisions. Instead they apply only to certain details of the present section. It is contemplated that a new general preface reflecting these recent changes will appear with the next section that will be issued.

Volume 5, when completed, will contain the following sections: Section 13 - Viscosity Effects, Section 14 - Heat Transfer, Section 15 - Properties of Gases, Section 16 - Mechanics of Rarefied Gases. Section 15 is being issued at this time; the remaining sections for Volume 5 will be issued when completed.

The presently issued version of Section 15 is confined to certain properties of flow characteristics of atmospheric air only. However, since the Handbook is being issued in loose-leaf form, the broader title of "Properties of Gases" is being retained so as to avoid the necessity for changing the section title when and if a supplement is issued for this section. It is planned to continue this policy in regard to all other sections of the Handbook.

Since the publication of Volumes 1 and 2, the contents of future volumes in the Handbook series have been changed in accordance with the outline set forth on page iii of this Preface under caption: "Contents of Future Volumes in the Handbook of Supersonic Aerodynamics Series". The numbers in parentheses following the section titles indicate the years in which the sections are expected to become available for distribution.

The numbering system for Volume 5 is the same as that used in Volumes 2 and 4.

Agencies and individuals interested in the aeronautical sciences are invited to submit and to recommend material for inclusion in the Handbook; full credit will be given for all such material used. Regarding the selection of material and the preparation of the volumes in the Handbook Series, the Applied Physics Laboratory earnestly solicits constructive criticisms and suggestions. Correspondence relating to the editing of the Handbook should be directed to

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CONTENTS OF FUTURE VOLUMES IN THE HANDBOOK OF SUPERSONIC AERODYNAMIC SERIES

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SECTION 15 - PROPERTIES OF GASES

CONTENTS

SECTION 15 - PROPERTIES OF GASES

Primary Symbols

a	velocity of propagation of compressional (sound) waves
a	a Beattie-Bridgeman coefficient (cf. Equation 1500.111-2)
A_o	a Beattie-Bridgeman coefficient (cf. Equation 1500.111-2)
b	a Beattie-Bridgeman coefficient (cf. Equation 1500.111-2)
b	$(= 1 + \frac{2(U_2 - U_1)\ M_2}{RT_2} - c)$ (cf. Equations 1508-4, -6)
b_o	$(= \frac{2\pi}{3} N r_o^3)$
B or $B(T)$	second virial coefficient
$\overline{B}$	$(= B/M)$ (cf. Equations 1508-2, -3)
$B^{(o)}$ or $B^{(o)}(\tau)$	a function of τ (useful in computing the second virial coefficient B)
B_n	$(= (4n!)^{-1}\ \Gamma[(2n - 1)/4])$ (cf. Equations 1502.11-4, -6)
B_o	a Beattie-Bridgeman coefficient (cf. Equation 1500.111-2)
c	a Beattie-Bridgeman coefficient (cf. Equation 1500.111-2)
c	$(= \frac{p_1\ M_2}{\rho_1\ RT_2})$ (cf. Equations 1508-4, -5)
c_p	specific heat at constant pressure
c_v	specific heat at constant volume
c_v^o	specific heat at constant volume - ideal state
C	third virial coefficient
°C	degrees Centigrade
D	fourth virial coefficient
e	base of natural (Napierian) logarithms
E_i	energy of a gas particle in the i-th quantum state
$E(r)$	Lennard-Jones form of intermolecular potential energy of a pair of colliding molecules (cf. Equation 1502.11-1)
f	number of pure gas components in a gas mixture
F_T^o	free energy of a gas in the ideal state

g_i	degeneracy of the i-th state
H_T	enthalpy of a real gas
H_T^o	enthalpy of a gas in the ideal state
k	coefficient of thermal conductivity
k	a constant useful in computing the second virial coefficient B
k	Boltzmann constant
°K	degrees Kelvin
M	molecular weight
n	any whole number from 1 to infinity (1, 2, 3, 4, etc.) (cf. Equations 1502.11-4, -6)
n	total number of moles per gram (cf. Equation 1503.3-3)
n_i	number of moles of i-th specie in unit mass of a gaseous mixture
N	number of molecules in volume considered
N_{Pr}	Prandtl number
p	pressure
r	distance between two molecules, center-to-center
r_o	collision diameter for encounters in which two molecules collide with negligible kinetic energy
R	gas constant
°R	degrees Rankine
S_T	entropy of a real gas
S	empirical constant in Sutherland's viscosity equation
S_T^o	entropy of a gas in the ideal state
S_o	entropy of a real gas under standard sea-level conditions
T	absolute temperature
T_o	273.16°K(0°C)
U_o^o	internal energy of a gas in the ideal state at a temperature of absolute zero
U_T^o	internal energy of a gas in the ideal state
U_T	internal energy per mole

u_1	velocity of shock front with respect to the gas on the low pressure side of the front
V	volume of one mole
x	mole fraction; also $(4/\tau)^{1/2}$ (cf. Equation 1502.11-4, -5)
z	$(= p/(\rho/\rho_o))$
Z	compressibility factor (= pV/RT)
β	$(= 1 + \bar{B}_2 (\rho_2 - \rho_1))$ (cf. Equations 1508-4, -7)
γ	ratio of specific heats $(= c_p/c_v)$
Δ	tabular difference
Γ	gamma function (a mathematical symbol)
ϵ	maximum energy of attraction between two molecules
μ	coefficient of absolute viscosity
μ_o	coefficient of absolute viscosity at standard sea-level conditions
ν	coefficient of kinematic viscosity
ρ	density
ρ_o	density at standard sea-level conditions
σ	Riemann characteristic
τ	reduced temperature $(= kT/\epsilon)$

Auxiliary Symbols

Subscripts

F, M	pound force (lb_F); pound mass (lb_M)
i, j, k	species of gas in a gas mixture
p, v, s	at constant pressure, volume, or entropy
T	function of temperature; also at a constant temperature
1	conditions on upstream (low-pressure) side of a shock wave
2	conditions on downstream (high-pressure) side of a shock wave
gm, lb, slug	gram, pound, or slug molar mass, respectively

SECTION 15 - PROPERTIES OF GASES

This section of the Handbook of Supersonic Aerodynamics was prepared at the Applied Physics Laboratory of The Johns Hopkins University, with the cooperation of the Ordnance Aerophysics Laboratory, Consolidated Vultee Aircraft Corporation, Daingerfield, Texas. The textual matter and certain portions of the tables of this section are based primarily on the pioneer work of Professors Joseph O. Hirschfelder and Charles F. Curtiss of the University of Wisconsin's Naval Research Laboratory. Other portions of the tables of this section, namely the tables for dry air at temperatures up to and including 3000 degrees Kelvin, are based on the pertinent NBS-NACA Tables of Thermal Properties of Gases as compiled by Mr. Joseph Hilsenrath and colleagues at the National Bureau of Standards at the suggestion of and with the cooperation of the National Advisory Committee for Aeronautics.

The majority of the tables that appear in this section were especially prepared, on digital computing machines, from the aforementioned tables under the supervision of Dr. E. C. Kennedy of the Ordnance Aerophysics Laboratory, for initial publication in this Handbook.

1500 Introduction

For most applications in the past it has been found that tables of the ideal properties of gases, computed with the aid of the perfect gas laws, have been adequate. In recent years, however, especially in connection with high Mach number supersonic vehicles and high Mach number supersonic wind tunnels, and also in connection with rocket- and jet-propulsion systems for subsonic as well as supersonic vehicles, the need for tables of the properties of real gases in chemical equilibrium at the extremes of temperature and pressure involved in these new applications has become increasingly apparent.

This need for new tables is illustrated by the tabulations below for the internal energy of dry air. It is seen that for this case the dissociation effect is of especial importance at high temperatures and low densities, and that the gas imperfection (virial) effect is a maximum at low temperatures and high densities.

Density Ratio (ρ/ρ_o)	Temperature (°K)	Internal Energy (cal/gram)		
		Ideal State	Virial Correction	Dissociation Correction
0.008	700	122.55	0.0003	-0.81
	1000	181.50	0.0003	-0.83
	3000	637.27	-0.00004	319.65
1	700	122.47	0.04	-0.81
	1000	181.44	0.03	-0.84
	3000	637.29	-0.01	63.82
25	700	120.57	1.00	-0.89
	1000	179.88	0.84	-1.07
	3000	637.76	-0.24	37.86

The symbolism throughout this section is in accordance with the lists on Symbols Pages 1500-1 to 1500-3 inclusive.

1500.1 Existing Tables of Real Gas Properties

Many tables exist that record certain properties of various gases, for example, the "International Critical Tables" (Reference 1) and Keenan and Kaye's "Gas Tables" (Reference 2).

For present purposes, however, the effects of gas imperfections and of molecular dissociation upon the properties and flow behavior of dry and of moist air are of especial interest, and consequently only the following tables are considered in the present version of this section of the Handbook.

1500.11 Hirschfelder-Curtiss Tables

Professors Joseph O. Hirschfelder and Charles F. Curtiss pioneered in the preparation of tables of certain properties of both dry and moist air that took into consideration not only the molecular dissociation of the air components that occurs at high temperatures and low pressures, but also deviations from the ideal gas state which are of significance. These tables for the properties of "real" gases were published in 1948 as University of Wisconsin, Naval Research Laboratory Reports numbered CM-472 (Reference 3) and CM-518 (Reference 4).

1500.111 University of Wisconsin Report CM-472

In the earlier report (CM-472) properties were tabulated for temperatures up to 700°K (1260°R) only, and for pressures from 0.01 to 100 standard sea-level atmospheres (this range of pressure was covered by five values of pressure spaced uniformly in geometric progression with a common ratio of 1 to 10). Only dry air and pure nitrogen were included.

Since only relatively low temperatures were considered in the earlier report, there was no need to consider the dissociation effects that are principally characteristic of high temperatures. Consequently only the gas imperfections were considered. For pressures of 10 atmospheres and less the virial equation of state was used in the form

$$\frac{pV}{RT} = 1 + \frac{B}{V} + \frac{C}{V^2} + \cdots \qquad (1500.111\text{-}1)$$

where B, C, ... are functions of temperature (T) and are known as the second, third, etc. virial coefficients respectively (see the preceding symbols list for significance of the other symbols). For a pressure of 100 atmospheres and whenever the temperature was sufficiently high to warrant the use of the third and higher virial coefficients, the Beattie-Bridgeman equation of state was used instead. It is

$$\frac{pV}{RT} = \left(1 - \frac{c}{VT^3}\right)\left(1 + \frac{B_o}{V} - \frac{bB_o}{V^2}\right) - \frac{A_o}{RTV}\left(1 - \frac{a}{V}\right) \qquad (1500.111\text{-}2)$$

in which the numerators of the various terms in the right-hand member of this equation are all constants that are independent of temperature as well as of pressure and volume.

This report includes also a tabulation of a function F from which the second virial coefficients of air and of the constituents of air could be calculated. Also, the second virial coefficient and its temperature derivative (useful for computing certain real properties) were tabulated for dry air (and for nitrogen) for temperatures up to 720°K only.

These virial coefficients and the appropriate Beattie-Bridgeman coefficients for dry air were then used in conjunction with the basic properties of air in the ideal state (i.e., the zero pressure, infinite-molecular-distance state) to compute the properties of dry air in its real state, ignoring dissociation effects as previously stated.

1500.112 University of Wisconsin Report CM-518

In the later report (CM-518), the temperature range was extended to 5000°K (9000°R). At these high temperatures dissociation effects may be considerable. Therefore, there were computed the chemical equilibrium compositions of both dry and moist air at the tabulated values of temperature and density. In computing these compositions, Hirschfelder and Curtiss took into consideration a total of 26 molecular, atomic and ionic species of which dissociated air may be composed. One independent parameter used in the CM-518 tables was density ratio (ρ/ρ_o), where the subscript o indicates standard sea-level conditions. Six values of the density ratio were used, ranging from 0.008 to 25 in uniform geometric progression with a common ratio of 1 to 5 (.008, .04, .2, 1, 5, 25). A second independent parameter in this report, temperature, has an incremental value of 100°K (180°R) throughout the range from 300 to 5000°K (540 to 9000°R). A third independent parameter used for tabulating the thermodynamic properties in this report was moisture content. Three values of moisture content, in addition to zero, were included; namely, 0.5, 1 and 5 mole per cent of water.

Table I of report CM-518 records the results of the computations of the equilibrium composition of air under the aforementioned conditions of temperature, pressure and of moisture content. It appears that this table remains the only comparable table of equilibrium composition values for air available at the present time.

Also in report CM-518 are tabulations of the thermodynamic properties (density, internal energy, entropy, specific heats, ratio of specific heats and velocity of sound) of both dry and moist air, dissociation and imperfection effects both being considered. In addition, there are tabulations in this report of the values of certain properties that result when dry and moist air experience isentropic (constant entropy) changes in temperature, for each of several values of entropy. Also included are tables of certain properties on the down-stream (high pressure) side of a normal shock wave corresponding to various combinations of up-stream (low pressure) temperatures and density, and of down-stream temperatures. These isentropic and shock front tables remain the only comparable tables available at the present time. In addition, report CM-518 contains tables for the viscosity of dry and moist air, and for the thermal conductivity of dry air as a function of density ratio and temperature.

1500.12 NBS-NACA Tables

Subsequent to the publication of the Hirschfelder-Curtiss tables described in the foregoing paragraphs, a considerable number of the NBS-NACA Tables of the Thermal Properties of Gases (Reference 5) have been compiled and distributed. This series of tables, when completed, is expected to include the properties of about 18 different gases in both the ideal state and in the natural ("real") state.

The NBS-NACA tables for dry air cover in general a temperature range from 50 to 3000°K (90 to 5400°R), and the increments in temperature are smaller than the increments in the Hirschfelder-Curtiss tables; a second

parameter is pressure, in standard atmospheres - eleven values of pressure ranging from 0.01 to 100 atmospheres are used and these are grouped into four series as follows:

.01	.1	1	10
	.4	4	40
	.7	7	70
	1.0	10	100

All of the properties tabulated in these NBS-NACA tables are expressed in non-dimensional units, so that for many applications it is necessary to convert to a convenient system of units. A number of conversion factors are supplied with each of these tables for the convenience of the user.

The NBS-NACA tables are based on more recent data than the Hirschfelder-Curtiss tables for the thermodynamic properties of the various constituents of air, and they are generally considered to be the most reliable tables available for dry air for temperatures up to 3000°K. Each of these NBS-NACA tables contains a statement of the reliability of the tables and also a statement concerning interpolation procedures.

1500.13 University of Minnesota Tables

Professor Newman A. Hall, of the University of Minnesota, has recently contributed to the engineering literature on this subject with the publication of a report entitled "Thermodynamic Properties of Air, Nitrogen and Oxygen as Imperfect Gases" (Reference 6). Professor Hall and his colleague, W. E. Ibele, first reevaluated the force constants that appear in the Lennard-Jones formulation of the intermolecular potential, so as to obtain the best possible correlation with the available experimental data. These values for the force constants were then used in the manner of Hirschfelder, Curtiss and colleagues in computing certain thermodynamic properties of nitrogen, oxygen and air. The results are expressed in British units; the tables are for temperatures ranging from 100 to 5000 degrees Rankine, and for densities from 0.02 to 9.00 pounds per cubic foot. The properties are tabulated as corrections which are to be added to the ideal gas properties, to allow for the effects of imperfections in the molecules.

Unlike the University of Wisconsin and the NBS-NACA tables, both of which assume that the gases at high temperatures have become dissociated to a condition of chemical equilibrium, the Hall-Ibele tables assume that no dissociation has occurred.

1500.14 RAND Corporation Tables

The RAND Corporation has also contributed to the engineering literature on the properties of air with the publication of a report entitled "The Composition and Thermodynamic Properties of Air at Temperatures from 500 to 8000°K and Pressures from 0.00001 to 100 Atmospheres" (Reference 7). This report includes values at fourteen temperatures at intervals of 500°K and at eight pressures in geometric progression that are multiples and submultiples of 10. The quantities tabulated are the equilibrium composition in mole fractions, molecular weight, specific total enthalpy above 298.16°K and specific entropy.

Because of the relatively small effect due to gas imperfections, these RAND tables - unlike any of the aforementioned tables - take into consideration only the dissociation effect.

1500.2 General Scope of Present Handbook Section

In this section of the Handbook there are presented a number of tables in which are tabulated certain thermal properties of dry and moist air for a considerable range of pressure and of temperature that make them applicable to certain problems of supersonic aerodynamics. These tabulations include tables of the thermodynamic properties (density, enthalpy, entropy, specific heat at constant volume, specific heat at constant pressure, ratio of specific heats, and velocity of sound), the transport properties (absolute and kinematic viscosity, and thermal conductivity), molecular weight, second virial coefficient, Prandtl number, dew point, isentropic changes and shock front conditions.

In this section there are also included brief discussions of the effects of moisture content, dissociation and gas imperfection (virial coefficients) upon these thermal properties, and short explanations of the derivations of the tables for isentropic changes and of shock front conditions.

1500.3 Sources, Units, Parameters and Conversion Factors

Two main sources have been used for the present tables: Report CM-518 (Reference 4) and the NBS-NACA Tables for Dry Air (Reference 5); in addition, one table (dew point) was obtained from CM-472 (Reference 3).

Since the tables of this section, as well as those of all other sections of this Handbook, are intended for use in the design of supersonic vehicles, all properties tabulated herein are expressed in British Engineering Units. In this system of units, the fundamental units include the pound (lb_F) as the unit of force; and the derived units include the slug as the unit of mass. Length is expressed in feet, and time in seconds or hours. Also, energy quantities are expressed in foot-pounds ($ft\text{-}lb_F$) because of the convenience of this unit in fluid dynamics.

All data for moist air were obtained from the Hirschfelder-Curtiss tables. Although much of the data for the dry-air properties reported by these authors have been superseded by the NBS-NACA tables, the differences between the Hirschfelder-Curtiss dry-air values and their corresponding moist air values are presently believed to represent most accurately the effect of the moisture content upon air. Therefore, the moisture residuals (moist-air values minus dry-air values) of the thermodynamic properties, molecular weight, and absolute viscosity are tabulated along with the most reliable dry-air values. By combining these moisture residuals with the corresponding dry air values, the most reliable moist-air value may readily be determined.

The following table gives detailed information regarding units, sources, conversion factors, and ranges with intervals for each table in this section. The conversion factors were derived from the fundamental constants listed in Table 1.30 of the NBS-NACA series (Reference 8).

Units, Sources, Conversion Factors and Ranges with Intervals

Handbook Table No.	Quantity	Symbol	Pressure	Moisture	British Units	Source, with Table No. (a)	Conversion Factor	Ranges & Intervals of Temp. (°K) (d)
1510.01	Molecular Wt.	M	(i)	(j)	$\frac{\text{slugs}}{\text{mole}_{\text{slug}}}$	Calc. from CM-518, I	---	700 (100) 5000
1510.02	Second Virial Coefficient	B			$\frac{\text{ft}^3}{\text{slug}}$	Calc. at NBS and APL	0.01779240	100 (10 to 50) 800 800 (100) 5000
1510.03	Density	ρ	(i)	(j)	$\frac{\text{slugs}}{\text{ft}^3}$	NBS, 2-18 CM-518, II	0.00250897 a) 0.002508854 b) 0.002504973 c) 0.002499152 d) 0.002462286	(e)
1510.04	Enthalpy	$H_T-U_o^o$, or H_T	(i)	(j)	$\frac{\text{ft lb}_F}{\text{slug}}$	NBS, 2.22/1, or Calc. from CM-518, III (b)	843,971 45,036.02	(e)
1510.05	Entropy	S_T	(i)	(j)	$\frac{\text{ft lb}_F}{\text{slug}^\circ\text{R}}$	NBS, 2.22/2 CM-518, IV (c)	1716.48 25,020.01	(e)
1510.06	Specific Heat, Volume Constant	c_v	(i)	(j)	$\frac{\text{ft lb}_F}{\text{slug}^\circ\text{R}}$	Calc. from NBS, 2.24/1 & 2.26 CM-518, V	--- 25,020.01	(f)
1510.07	Specific Heat, Pressure Constant	c_p	(i)	(j)	$\frac{\text{ft lb}_F}{\text{slug}^\circ\text{R}}$	NBS, 2.24/1 CM-518, VI	1716.48 25,020.01	(f)
1510.08	Specific Heat Ratio	γ	(i)	(j)	non-dimensional	NBS, 2.26 CM-518, VII	--- ---	(e)
1510.09	Velocity of Sound	a	(i)	(j)	$\frac{\text{ft}}{\text{sec}}$	NBS, 2.32 CM-518, VIII	1087.43 3.280833	(e)
1510.10a	Coefficient of Viscosity	μ			$\frac{\text{slugs}}{\text{ft sec}}$	NBS, 2.39/1	3.58395×10^{-7}	100 (10) 1900
1510.10b	Coefficient of Viscosity	μ		(j)	$\frac{\text{slugs}}{\text{ft sec}}$	CM-518, II	2.08855×10^{-3}	(g)

1510.10c	Coefficient of Kinematic Viscosity	ν			$\frac{ft^2}{sec}$	NBS, 2.39/2	1.42845×10^{-4}	100 (10) 1900
1510.11a	Coefficient of Thermal Conductivity	k			$\frac{ft\ lb_F}{ft\ hr\ ^\circ R}$	NBS, 2.42	10.8545	80 (10) 1000
1510.11b	Coefficient of Thermal Conductivity	k	(i)		$\frac{ft\ lb_F}{ft\ hr\ ^\circ R}$	CM-518, 11a	188,120.1	(g)
1510.12	Prandtl No.	N_{Pr}			non-dimensional	NBS, 2.44	---	100 (10) 1000
1510.13	Dew Point Properties	p			atm	CM-472, XXa	---	70 (10) 130
		ρ			$\frac{slugs}{ft^3}$		1.940336	
		$H_T - U_o^o$			$\frac{ft\ lb_F}{slug\ ^\circ R}$		45,036.02	
		S_T			$\frac{ft^3}{slug}$		25,020.01	
1510.14	Isentropic Changes (k)	p		(j)	atm	CM-518, IX	---	(h)
		ρ/ρ_o			non-dimensional		---	
		U_T			$\frac{ft\ lb_F}{slug}$		45,036.02	
		a			$\frac{ft}{sec}$		3.280833	
		σ			$\frac{ft}{sec}$		3.280833	
1510.15	Shock Front Conditions (m)	ρ_2/ρ_1		(j)	non-dimensional	CM-518, X	---	(h)
		p_2			atm		---	
		U_2			$\frac{ft\ lb_F}{slug}$		45,036.02	
		u_1			$\frac{ft}{sec}$		3.280833	

(a) The sources listed are tables from reports CM-472 (Reference 3), CM-518 (Reference 4), and NBS-NACA tables (Reference 5). When both an NBS-NACA table and a CM-518 table are listed as sources for a single Handbook table, the data for dry-air below 3000°K have come by conversion from the NBS-NACA tables, and the data for dry-air above 3000°K, and all moist-air data, have come by interpolation and conversion from the CM-518 tables.

(b) CM-518, Table III, lists internal energy U_T to which pV must be added to obtain H_T.

(c) CM-518, Table IV, lists entropy $(S_T - S_o)$, where S_o is entropy at one atmosphere standard sea-level pressure and 273.16°K. To obtain S, the following values for S_o are added to $(S_T - S_o)$, and the conversion factors are then applied to the results.

Table IVa	1.6191	Table IVc	1.6276
Table IVb	1.6233	Table IVd	1.6592

(d) All tables are functions of temperature. The notation a(b)c(d)e, for example, means that the overall range is from a to e, with intervals of b between a and c, and intervals of d between c and e.

(e) 50 (10) 800 (50) 3000 (100) 5000

(f) 50 (10) 800 (50) 3000 (100) 4800

(g) 100 (50) 200 (100) 600 (200) 1600, 2000, 3000, 5000

(h) 273.2, 300 (100) 5000

(i) These quantities, which are functions of pressure, list values from 0.01 to 100 standard sea-level atmospheres, and these are grouped into four series as follows:

0.01	0.1	1	10
	0.4	4	40
	0.7	7	70
	1.0	10	100

(j) These quantities, which are functions of moisture content, list values for mole percentages of moisture of 0.0 (dry air), 0.5, 1.0 and 5.0.

(k) A third parameter of the Isentropic Changes table is entropy, ranging from 0 to 1.6 cal/gm °K (above the entropy at zero degrees absolute temperature).

(m) Parameters of the shock table, in addition to moisture content and the downstream parameter of temperature, are the upstream conditions of density ratio (.008 and 1) and temperature (273.2°K for all moisture values, in addition to which temperatures of 175 and 500°K are used for the dry air table).

1501 Composition of Air

The composition of dry air under standard sea-level conditions of temperature and pressure, as used in this Handbook section, is identical to that used in the Hirschfelder-Curtiss tables and the NBS-NACA tables. This in turn was derived from the composition as recorded by Humphreys (Reference 9) and reproduced in Volume 1, Section 3, of the present Handbook (Reference 10). Unfortunately Humphreys' values for percentage composition by volume and those of his predecessor Paneth (Reference 10, Table 3-1) do not add to exactly 100 percent; therefore, Hirschfelder and Curtiss adjusted the percentages of the various constituents so that they would be consistent and their sum would be exactly 100 percent. Then, to simplify the computations, the trace of krypton was replaced by an equal amount of neon, with the results as shown in the following table. This table also lists the molecular weights of the individual constituents and it shows that the combining of these values leads to a value of 28.966 for the molecular weight of dry air under standard sea-level conditions.

COMPOSITION OF DRY AIR UNDER STANDARD SEA-LEVEL CONDITIONS

(1)	(2)	(3)	(4)
Constituent	"Mole Fraction" (Fractional Composition by Volume)	Molecular Weight	(2) x (3)
Nitrogen (N_2)	0.780881	28.016	21.87716
Oxygen (O_2)	0.209495	32.000	6.70384
Argon (A)	0.009300	39.944	0.37148
Carbon Dioxide (CO_2)	0.000300	44.010	0.01320
Neon (Ne)	0.000019	20.183	0.00038
Helium (He)	0.000005	4.003	0.00002
Totals	1.000000		28.96608

In addition to dry air, Hirschfelder and Curtiss considered also three samples of moist air containing 0.5, 1.0 and 5.0 mole per cent of water. For each sample of moist air under standard sea-level conditions, the mole fraction of each constituent as tabulated in column 2 of the foregoing table is decreased by the mole per cent of moisture for that sample (e.g., for 5 percent moisture the mole fraction of every constituent other than water is 0.95 of that listed in this table, and the mole fraction of the moisture content is 0.05; therefore, the sum of the mole fractions is unity). When this is done, the mole fractions become as tabulated below:

H_2O	0.050000
N_2	0.741837
O_2	0.199020
A	0.008835
CO_2	0.000285
Ne	0.000018
He	0.000005
	1.000000

From these mole fractions a computation like that of the preceding table gives a molecular weight of 28.41859 (say, 28.419) for moist air with a 5 per cent water content at standard sea-level conditions.

When the mole fractions, such as those tabulated above, are divided by the molecular weight of the mixture (moist air, for example), one obtains the number of moles of each specie in a unit mass of the mixture. This is the quantity that Hirschfelder and Curtiss have computed for dry and moist air, and designated by the symbol n_i.

At temperatures and densities other than standard sea-level values, Hirschfelder and Curtiss have determined the effect of dissociation under conditions of chemical equilibrium, and the resultant values of n_i are tabulated in Table I of Reference 4. This table is considered basic and as such it has been used by Dr. Wm. S. Benedict at the National Bureau of Standards in computing the properties of air as tabulated in the NBS-NACA tables. Although this table is unique and basic, it is not reproduced here because of its length (48 pages of closely-typed figures).

There is included in this section of the Handbook, however, a table that reflects the dissociation effects in terms of the molecular weight of the air mixtures. These molecular weights are computed by taking the reciprocal of sum of the n_i values that are tabulated in Table I of Reference 4, and they are listed in Table 1510.01 of this Handbook.

The molecular weights tabulated in Table 1510.01 should be useful in computing certain properties on the down-stream (high-pressure) side of shock waves corresponding to other combinations of up-stream (low-pressure) conditions than are listed in this section of the Handbook.

Since the Hirschfelder-Curtiss tables had density ratio (ρ/ρ_o) as an independent parameter and the present Handbook table was to have pressure as the independent parameter, interpolation was necessary. The procedure for this is exactly as described in subsection 1503 for the conversion of the thermodynamic properties.

In a number of instances the molecular weights of Table 1510.01 do not agree perfectly with the values for the individual components as reported in Reference 4. This is because errors (probably typographical) were discovered in the Reference 4 tables, and corrections were then made before computing the final values for this Handbook.

1502 Gas Imperfections

After the experimental techniques were improved so as to result in sufficiently accurate measurements, it was learned that gases in general do not accurately obey the perfect gas law relating pressure, volume and temperature (pV/T = constant). Since that time many empirical and semi-empirical "equations of state" have been proposed to represent the p-V-T relationships that exist for the "real" or "imperfect" gases. Among the better known equations of this type are the van der Waal and the Beattie-Bridgeman equations. However, all such equations suffer from their limited range of applicability, and also from the fact that the constants in the equations have at best only a qualitative theoretical significance. The virial equation of state is free of these shortcomings because it is based on a sound theoretical foundation; it can be derived from the kinetic theory of gases. Hence it has the added advantage of furnishing quantitative information about the nature of the intermolecular forces.

1502.1 Virial Equation of State

Several forms of the virial equation of state exist, but in this Handbook only the form in which the compressibility factor ($Z = pV/RT$) is expressed as a power series of the reciprocal-volume is used. This virial equation is then

$$\frac{pV}{RT} = 1 + \frac{B}{V} + \frac{C}{V^2} + \frac{D}{V^3} + \ldots . \qquad (1502.1\text{-}1)$$

where R is the gas constant and the numerators (B, C, D....)* of the reciprocal-volume terms are known as the second, third, fourth .... virial coefficients. Each pure or elementary gas (e.g., nitrogen or oxygen) has its set of characteristic virial coefficients, which depend parametrically upon the intermolecular potential of that species of gaseous molecules; and these coefficients are also functions of the temperature. The virial coefficients (B, C, D ....) represent, respectively, the deviations of the gas from non-ideality, resulting from two, three, four .... body collisions and from the inclusion of a more accurate estimate of the intermolecular forces (*Reference 11*).

1502.11 Virial Coefficients

For a particular pure gas the dependence of the virial coefficients upon the intermolecular potentials may be derived from the Lennard-Jones form of the potential function

$$E(r) = 4\epsilon\left[\left(\frac{r_o}{r}\right)^{12} - \left(\frac{r_o}{r}\right)^{6}\right] \qquad (1502.11\text{-}1)$$

where the first term of the right-hand member represents the mutual repulsion that exists when the molecules are very close together, and the second term represents the mutual attraction experienced for relatively large distances of separation.

Lennard-Jones has also shown, when his form of the potential function is used, that the second virial coefficient B(T) can be evaluated by a

*These virial coefficients are not the same as, but are related to, the virial coefficients that apply when the compressibility (pV/RT) is expressed as a power series of pressure, or of density, etc.

process that involves an infinite series of gamma functions. More specifically B (T) can be calculated from

$$B(T) = b_o B^{(o)}(\tau) \qquad (1502.11\text{-}2)$$

where

$$b_o = \frac{2\pi}{3} N r_o^3 \qquad (1502.11\text{-}3)$$

$$\tau = \frac{kT}{\epsilon}$$

and

$$B^{(o)}(\tau) = -x^{1/2} \sum_{n=o}^{\infty} B_n x^n = x^{1/2}\left[\Gamma\left(\frac{3}{4}\right) - \sum_{n=1}^{\infty} B_n x^n\right] \qquad (1502.11\text{-}4)$$

where

$$x = \left(\frac{4}{\tau}\right)^{1/2} \qquad (1502.11\text{-}5)$$

and

$$B_n = (4n!)^{-1}\,\Gamma\left[(2n - 1)/4\right] \qquad (1502.11\text{-}6)$$

Lennard-Jones in 1924 published $B^{(o)}(\tau)$ for only a few values of τ (Reference 12); more recently (in 1950) Professor Hirschfelder and colleagues at the University of Wisconsin made these computations for 82 values of the reduced temperature τ, in the range from 0.30 to 400. These values are recorded in References 3 and 11; and the first, second and third temperature derivatives of this second virial coefficient are also recorded in Reference 11.

In order to increase the utility of these second virial coefficients as functions of τ, the Thermodynamics Section of the National Bureau of Standards has subtabulated, for over 500 values of τ, the results of the original University of Wisconsin computations in the range from 0.30 to 50 (Reference 13).

The second virial coefficients for dry air from 50 to 720°K were calculated by the University of Wisconsin group, and are recorded in Reference 3 (Table X). These computations were extended by the National Bureau of Standards group to cover temperatures to and including 3000°K for use in the preparation of the NBS-NACA Tables of Thermal Properties of Gases. For dry air, the National Bureau of Standards used, on the basis of the latest reliable data, the following values for computing the second virial coefficient:

$$\frac{\epsilon}{k} = 101.169°K$$

$$b_o = 59.13 \text{ cc/mol}$$

The NBS values listed above for dry air have been used, in conjunction with the NBS subtabulation of the University of Wisconsin values for the function $B^{(o)}(\tau)$, to compute values of the second virial coefficient of dry air at temperatures up to 5000°K. These values are tabulated in Table 1510.02 of this Handbook section and they should prove useful in computing certain real properties of dry air not tabulated in the present Handbook.

The third virial coefficient for dry air was computed by both the University of Wisconsin and the National Bureau of Standards groups. Both groups found that the effect of the third and higher virial coefficients is extremely small within the ranges of temperature and pressure used. Consequently only the second virial coefficients are tabulated in this Handbook section.

For a gas mixture (e.g., air, a mixture of several elemental gases as discussed in Subsection 1501) of f components, the virial coefficients are related to the corresponding coefficients of the constituent gases by equations of the form:

$$B_{mixture} = \sum_{i=1}^{f} \sum_{j=1}^{f} B_{ij} x_i x_j \qquad (1502.11\text{-}7)$$

$$C_{mixture} = \sum_{i=1}^{f} \sum_{j=1}^{f} \sum_{k=1}^{f} C_{ijk} x_i x_j x_k \qquad (1502.11\text{-}8)$$

Consequently, in order to compute the virial coefficients for a mixture of elemental gases, it is necessary that force constants for dissimilar molecules be known. J. O. Hirschfelder and colleagues have demonstrated the adequacy of the following relationships for the force constants, and these have served as the basis for the tables that have been used in preparing the present Handbook section:

$$(r_o)_{ij} = 1/2 \left[(r_o)_i + (r_o)_j\right] \qquad (1502.11\text{-}9)$$

$$\left(\frac{\epsilon}{k}\right)_{ij} = \left[\left(\frac{\epsilon}{k}\right)_i \cdot \left(\frac{\epsilon}{k}\right)_j\right]^{1/2} \qquad (1502.11\text{-}10)$$

1503 Thermodynamic Properties

The thermodynamic properties of air tabulated in the present Handbook section are density, enthalpy, entropy, specific heats, ratio of specific heats and velocity of sound. The three independent parameters for which these are given are moisture content, temperature and pressure.

As stated in a foot-note to the table in Section 1500.3, the thermodynamic properties of dry air up to 3000°K were obtained from the NBS-NACA tables (Reference 5); the dry air data from 3000 to 5000°K and the moist air data at all temperatures were obtained from the Hirschfelder-Curtiss report CM-518 (Reference 4). Since the CM-518 report used density ratio (ρ/ρ_o) as an independent parameter, and it was desired to use pressure instead of density ratio for the present Handbook tables in accordance with usage in the NBS-NACA tables, an interpolation process was necessary. For maximum accuracy a six-point uneven-interval Lagrangian interpolation equation (Reference 14, page 29) was chosen. The coefficients for this equation were determined using the pressure-density table in report CM-518, and with the aid of these coefficients, all of the thermodynamic tables and the composition table were interpolated to give pressure as an independent parameter. The interpolation was done with the aid of digital computing machines under the direction of Dr. E. C. Kennedy at the Ordnance Aerophysics Laboratory, Daingerfield, Texas.

The effect of moisture on all thermodynamic properties is indicated by a tabulation of moisture residuals as described in subsection 1500.3.

1503.1 Density

The pressure-density table in report CM-518 contains a tabulation of pressure as a function of temperature and density ratio so that interpolation was necessary to make pressure instead of density ratio the independent parameter. The interpolations are based on the logarithm of pressure and a factor z ($= p/(\rho/\rho_o)$ in order to reduce the inaccuracies that would otherwise result due to the wide variations in pressure and density ratio that exist in report CM-518. The values used for ρ_o are as follows:

Moisture (Mole Per Cent)	ρ_o (slugs/ft^3)
0	0.00250885
0.5	0.00250497
1	0.00249915
5	0.00246229

The Handbook tabulations for density as a function of temperature and pressure are listed in Table 1510.03 which is based on the pertinent NBS-NACA table (Reference 5a) and the University of Wisconsin tables (Reference 4).

1503.2 Enthalpy

The internal energy of an elementary ("pure") gas, U_T^o, in the ideal gas state (sometimes referred to as the "zero-pressure" state) is a function of temperature only. The amount by which U_T^o differs from U_o^o (gas in the ideal state at zero absolute temperature) may be calculated from

statistical mechanics (cf. Reference 15) using the equation

$$U_T^o - U_o^o = RT^2 \frac{d}{dT}\left(\ln \sum_i g_i e^{-E_i/kT}\right) \qquad (1503.2\text{-}1)$$

where E_i is the energy of the gas particle in the i-th state and g_i is the degeneracy of that state (both determined by spectroscopic means); and the other symbols are as indicated in the list of symbols (Symbols Pages 1500-1 to 1500-3). For certain of the constituents of air the National Bureau of Standards has computed unpublished values of $U_T^o - U_o^o$ using the most reliable basic data for the properties in the i-th states. Since the enthalpy H_T^o for the "pure" gas in the ideal state is also a function of the temperature only, its magnitude above the internal energy U_o^o may be determined by means of the relation

$$H_T^o - U_o^o = (U_T^o - U_o^o) + RT \qquad (1503.2\text{-}2)$$

Values of $H_T^o - U_o^o$ for molecular nitrogen (N_2), molecular oxygen (O_2), carbon dioxide (CO_2), carbon monoxide (CO), molecular hydrogen (H_2), nitrogen dioxide (NO_2), atomic nitrogen (N), atomic oxygen (O), argon (A), helium (He) and atomic hydrogen (H) have been tabulated as a function of temperature by Mr. Harold W. Wooley in the NBS-NACA tables of thermal properties of gases.

Values of $U_T^o - U_o^o$ for certain other constituents of air are listed as a function of temperature in Reference 16.

The internal energy $U_T^o - U_o^o$ for a mixture of gases in the ideal state, assuming the internal energy of mixing is negligible, is given by

$$U_T^o - U_o^o = \sum_i n_i \left(U_T^o - U_o^o\right)_i \qquad (1503.2\text{-}3)$$

where $U_T^o - U_o^o$ is a function of pressure and temperature as a result of dependence of n_i on pressure and temperature due to dissociation effects. $(U_T^o - U_o^o)_i$ is the energy per mole of the i-th species.

There are tabulated in Reference 16 values for the internal energy U_o^o, in the ideal gas state at zero absolute temperature, for certain constituent components of air (based on the arbitrary set of reference values which assign the value zero to U_o^o for N_2, O_2, H_2, A and He). A more complete compilation of recent values is given in Reference 8.

The value of the internal energy U_o^o of a mixture of gases in the ideal state at zero-absolute temperature, assuming negligible internal energy of mixing, may be computed by

$$U_o^o = \sum_i n_i \left(U_o^o\right)_i \qquad (1503.2\text{-}4)$$

where U_o^o is a function of temperature and pressure through the dependence of n_i on pressure and temperature due to dissociation effects, and $(U_o^o)_i$ is the value of U_o^o for the i-th species.

The effect of gas imperfections, as revealed by the virial equation of state, can be computed with the aid of the classical differential equation of thermodynamics for the change of internal energy with specific volume, at constant temperature, thus

$$\left(\frac{\partial U}{\partial V}\right)_T = T\left(\frac{\partial p}{\partial T}\right)_V - p \qquad (1503.2\text{-}5)$$

Multiplying through by $(dV)_T$, making substitutions from the virial equation of state with all terms beyond the third virial coefficient ignored, and integrating between the limits of V and infinity, gives

$$U_T - U_T^o = -\frac{RT^2}{V}\left(\frac{dB}{dT} + \frac{1}{2V}\frac{dC}{dT}\right) \qquad (1503.2\text{-}6)$$

for the effect of gas imperfections upon the internal energy of a gas. The second term of this equation is negligible for air within the range of temperatures and pressures involved here.

The internal energy of the real gas U_T, taking into account both dissociation effects and gas imperfection effects, can be readily determined by

$$U_T = (U_T - U_T^o) + (U_T^o - U_o^o) + U_o^o \qquad (1503.2\text{-}7)$$

U_T is the internal energy at temperature T of the actual gaseous mixture above that of the energy of the elements in their standard states at zero absolute temperature. This arbitrary base is the same as that which assigns values of $U_o^o = 0$ to molecular nitrogen, molecular hydrogen, molecular oxygen, argon and helium. Values of U_T may be found in the Hirschfelder Report CM-518 (Reference 4). The enthalpy, H_T, may be calculated by the expression $H_T = U_T + pV$.

The NBS tables, when used with a suitable conversion factor, give values for $(H_T - U_o^o)$, the enthalpy of a gas above an arbitrary energy level U_o^o. This U_o^o is defined as the ideal energy of the air at zero absolute temperature based upon a composition of the air mixture corresponding to a low temperature and is, therefore, an arbitrary constant affixed to each value of enthalpy (Reference 5b). The difference between the NBS values and the Hirschfelder values is the arbitrary constant $U_o^o = -4.38 \times 10^4$ ft lb_F/slug.

Table 1510.04 of this Handbook tabulates values of $H_T - U_o^o$ in the temperature range up to and including 3000°K, and H_T in the temperature range above 3000 and up to 5000°K.

1503.3 Entropy

The entropy of a pure gas does not approach a limit at zero pressure (Reference 16, Equation 57, and Reference 8, page 0-4). Consequently, it is not feasible to define the ideal state for entropy in terms of the "zero-pressure" condition as it is for enthalpy, and instead S_T^o is arbitrarily defined as the entropy at a pressure of one standard sea-level atmosphere. According to statistical mechanics (cf. Reference 15), S_T^o may be calculated by the following equation

$$S_T^o = R\,(1 - \ln N) + RT\,\frac{d}{dT}\,\ln \sum_i g_i e^{-\frac{E_i}{kT}} + R \ln \sum_i g_i e^{-\frac{E_i}{kT}} \qquad (1503.3\text{-}1)$$

where N is the number of molecules in the volume V under consideration, and the other symbols have the same meaning as in sub-section 1503.2.

The values of the ideal entropy for molecular hydrogen (H_2), the hydroxyl radical (OH), molecular oxygen (O_2), and carbon moxoxide (CO) - based on the arbitrary reference level which assigns $S_o^o = 0$ to each pure constituent at 1 atmosphere of pressure and 0 degree absolute temperature (cf. Reference 3) - are tabulated as functions of temperature in Reference 23. More recent values for these four constituents and for CO_2 appear in the NBS tables of Reference 17. Additional values of S_T^o for certain pure gases are tabulated in RAND Report RM-149 (Reference 7).

For those constituents of air for which S_T^o has not been published, values of S_T^o can be obtained by use of the equation

$$S_T^o = \frac{U_T^o - U_o^o}{T} - \frac{F_T^o - U_o^o}{T} + R \qquad (1503.3\text{-}2)$$

where F_T^o is the ideal free energy of the constituent at temperature T in the ideal state (defined as one atmosphere of pressure - Reference 8, page 0-4).

The ideal entropy for a mixture of gases (e.g., air) assuming Dalton's Law of partial pressures holds, is given (cf. Reference 16) by:

$$S_T^o = \frac{1}{m} \sum_i n_i \left(U_T^o - U_o^o\right)_i - \sum_i n_i \frac{(F^o - U_o^o)_i}{T} + R \sum_i n_i - R \sum_i n_i \ln \frac{n_i}{n} p \qquad (1503.3\text{-}3)$$

where S_T^o is therefore a function of temperature and pressure as before (cf. 1503.2).

The increment of entropy due to gas imperfections, as represented by the virial equation of state, can be computed with the aid of

$$S_T - S_T^o = -R \ln p - \frac{RT}{V}\frac{dB}{dT} - \frac{R}{2V^2}\left(B^2 - C + T\frac{dC}{dT}\right) \qquad (1503.3\text{-}4)$$

The absolute entropy, S_T, of a real gas mixture, taking into account both dissociation effect and gas imperfections, is then determined by

$$S_T = (S_T - S_T^o) + S_T^o \qquad (1503.3\text{-}5)$$

If this absolute entropy for a gas mixture at 1 atmosphere pressure and a temperature of 273.16°K (0°C) is designated S_o, then $S_T - S_o$ can readily be determined. It is this value that is tabulated in the University of Wisconsin report (Reference 4).

Table 1510.05 of this Handbook lists values of the absolute entropy of the real gas mixture (air), taking into account dissociation and gas imperfection effects. This Handbook table is based on both the NBS-NACA tables (Table 2.22/2 of Reference 5b) and the University of Wisconsin tables (Reference 4), as previously described.

1503.4 Specific Heats

1503.41 Specific Heat at Constant Volume

The specific heat at constant volume of a pure gas, or a mixture of pure gases, is given by the thermodynamic relationship

$$c_v = \left(\frac{\partial U}{\partial T}\right)_v \qquad (1503.41\text{-}1)$$

When the virial equation for imperfect gases (Equation 1500.111-1) and Equation 1503.2-6 are combined with the foregoing equation for c_v (Equation 1503.41-1), the following equation is obtained:

$$c_v - c_v^o = -\frac{RT}{V}\left(2\frac{dB}{dT} + T\frac{d^2B}{dT^2} + \frac{1}{V}\frac{dC}{dT} + \frac{T}{2V}\frac{d^2C}{dT^2}\right) \qquad (1503.41\text{-}2)$$

The specific heat at constant volume of the real gas is tabulated in Table V of Reference 4. The NBS-NACA tables do not tabulate this property; however, the NBS-NACA tables do include values for the specific heat at constant pressure, c_p, and for the ratio of the specific heats, $\gamma = c_p/c_v$, and from these two values c_v can be computed.

Table 1510.06 of this Handbook contains values of c_v for dry air up to and including 3000°K that are derived by simple division from the NBS-NACA tables referred to in the foregoing paragraph. Values of c_v of dry air at temperatures above 3000°K, and the increments for all moisture contents, are taken from the University of Wisconsin tables, after interpolation as previously described.

1503.42 Specific Heat at Constant Pressure

Specific heats at constant pressure, c_p, are best obtained from the specific heat at constant volume, c_v, by the classical thermodynamic relation

$$c_p - c_v = \frac{-T\left(\frac{\partial p}{\partial T}\right)_v^2}{\left(\frac{\partial p}{\partial V}\right)_T} \qquad (1503.42\text{-}1)$$

Combining the virial equation of state (Equation 1500.111-1) with this equation, there results

$$c_p - c_v = R\,\frac{\left[1 + \frac{1}{V}\left(B + T\frac{dB}{dT}\right) + \frac{1}{V^2}\left(C + T\frac{dC}{dT}\right)\right]^2}{1 + \frac{2B}{V} + \frac{3C}{V^2}} \qquad (1503.42\text{-}2)$$

Combining the results obtained with this equation, with those of the preceding subsection, one obtains c_p by

$$c_p = (c_p - c_v) + c_v \qquad (1503.42\text{-}3)$$

Values of c_p for "real" air are tabulated in Table 1510.07, and they are based on the pertinent NBS-NACA tables (Reference 5c) and the University of Wisconsin tables (Reference 4).

1503.43 Ratio of Specific Heats

The ratio of the specific heat at constant pressure, c_p, to the specific heat at constant volume, c_v, is termed the "ratio of specific heats" and is designated γ. That is

$$\gamma = c_p/c_v \qquad (1503.43\text{-}1)$$

These ratios of the specific heat values for the real gas (air, with dissociation and imperfection effects considered), as taken from the pertinent NBS-NACA tables (Reference 5d) and the University of Wisconsin tables (Reference 4), are tabulated in Table 1510.08.

1503.5 Velocity of Sound

The velocity of propagation, a, of compressional (sound) waves of infinitesimal amplitude and low frequency is given by the thermodynamic equation

$$a = \left[\left(\frac{\partial p}{\partial \rho} \right)_s \right]^{1/2} \qquad (1503.5\text{-}1)$$

Making use of another thermodynamic equation

$$\left(\frac{\partial p}{\partial V} \right)_s = \gamma \left(\frac{\partial p}{\partial V} \right)_T \qquad (1503.5\text{-}2)$$

and the relation

$$\rho = M/V \qquad (1503.5\text{-}3)$$

it follows that

$$a = \left[\frac{V^2}{M} \gamma \left(\frac{\partial p}{\partial V} \right)_T \right]^{1/2} \qquad (1503.5\text{-}4)$$

Combining with this the virial equation of state (Equation 1500.111-1) one obtains

$$a = \left[\frac{\gamma RT}{M} \left(1 + \frac{2B}{V} + \frac{3C}{V^2} \right) \right]^{1/2} \qquad (1503.5\text{-}5)$$

Table 1510.09 of this Handbook is taken from the corresponding tables of the NBS-NACA (Reference 5e) and University of Wisconsin (Reference 4) which in turn are based on Equation 1503.5-5.

1504 Transport Properties

The class of phenomena due to the transfer of mass, energy, or momentum across any given surface or interface as a result of molecular or electronic agitation is termed "transport phenomena". Among the principal transport phenomena are viscosity, thermal conductivity, and diffusion. Aerodynamic drag and aerodynamic heating effects are influenced especially by the first two of these transport properties, and consequently tables of viscosity and thermal conductivity coefficients for air are included in this section of the Handbook.

1504.1 Viscosity

Sutherland's empirical equation for the variation with temperature of the absolute viscosity coefficient μ is

$$\frac{\mu}{\mu_o} = \left(\frac{T}{T_o}\right)^{3/2} \left(\frac{T_o + S}{T + S}\right) \qquad (1504.1\text{-}1)$$

In the NBS-NACA Table for Viscosity of Dry Air (Reference 5f), the formulation is based on a value of $\mu_o = 1716 \times 10^{-7}$ gm cm^{-1} sec^{-1} (3.584×10^{-7} slugs ft^{-1} sec^{-1}) at a temperature of 0°C (32°F).

Using the former value for μ_o and a value of 110.4 for the empirical constant, S, the Sutherland formula takes the form

$$\mu = 145.8 \times 10^{-7} \times \frac{T^{3/2}}{T + 110.4}, \ \frac{gm}{cm\ sec} \qquad (1504.1\text{-}2a)$$

where T is expressed in degrees Kelvin. Or using the latter value for μ_o and a value of 198.7 for S, the Sutherland formula becomes

$$\mu = 2.270 \times 10^{-8} \frac{T^{3/2}}{T + 198.7}, \ \frac{slugs}{ft\ sec} \qquad (1504.1\text{-}2b)$$

where T is in degrees Rankine. Equation 1504.1-2a is the basis for the NBS-NACA Table 2.39/1, of Reference 5f, which is reproduced after conversion in Table 1510.10a of this Handbook.

Hirschfelder and associates at the University of Wisconsin have made calculations of the transport properties of air according to the rigorous theory, (Reference 18), and based upon the Lennard-Jones potential referred to in Subsection 1502.1. It is found that the quantum mechanical effects upon these transport properties are usually negligible, and this is the case for air. Moist air is included in their calculations, and the results are presented in Table XI of Reference 4, and in Table 10.5-4 of Reference 18. Table 1510.10b of this Handbook is based upon this Hirschfelder table.

The coefficient of kinematic viscosity ν, defined by

$$\nu = \mu/\rho \qquad (1504.1\text{-}3)$$

and given in Table 2.39/2 of Reference 5f is also reproduced after conversion in Table 1510.10c of this Handbook.

There is a small variation of viscosity of dry air with pressure, but the data are fragmentary and contradictory. Reference 5f records two empirical equations that have been proposed for dry air at 14°C (57.2°F) and at 20°C (68°F). They are, respectively, as follows:

$$\mu_{14} = \left[1856 + 2.95\ (p - 70)\right] \times 10^{-7},\ \frac{gm}{cm\ sec} \qquad (1504.1\text{-}4a)$$

or

$$\mu_{57.2} = \left[3876 + 6.16\ (p - 70)\right] \times 10^{-10},\ \frac{slugs}{ft\ sec} \qquad (1504.1\text{-}4b)$$

and

$$\mu_{20} = \left[1819.2 + 11.88p + 0.0128p^2\right] \times 10^{-7},\ \frac{gm}{cm\ sec} \qquad (1504.1\text{-}5a)$$

or

$$\mu_{68} = \left[3800 + 24.81p + 0.0267p^2\right] \times 10^{-10},\ \frac{slugs}{ft\ sec} \qquad (1504.1\text{-}5b)$$

where p is the absolute pressure in atmospheres.

1504.2 Thermal Conductivity

The empirical equation for the coefficient of thermal conductivity for CO_2-free dry air, k, that is used in the NBS-NACA table of Reference 5g is

$$k = \frac{0.6325 \times 10^{-5}\ T^{1/2}}{1 + \frac{245.4}{T} \times 10^{-12/T}},\ \frac{cal}{cm\ sec\ °K} \qquad (1504.2\text{-}1a)$$

or

$$k = \frac{1.5964\ T^{1/2}}{1 + \frac{441.7}{T} \times 10^{-21.6/T}},\ \frac{ft\ lb_{wt}}{ft\ hr\ °R} \qquad (1504.2\text{-}1b)$$

This equation is the basis for Table 2.42 of the NBS-NACA series (Reference 5g), on which Table 1510.11a of this Handbook is based.

By means of the simple kinetic theory for gases, one obtains a direct proportionality between the coefficient of conductivity, k , and the absolute viscosity, μ. Experimentally, this relationship is confirmed for monatomic gases for which the energy is all due to translational degrees of freedom; significant deviations from this relation are observed for polyatomic gases. To take into account approximately the transfer of energy between translational and internal degrees of freedom (Reference 18) for polyatomic molecules, Euken proposed an equation which in modified form becomes (Reference 4)

$$k = \mu\left(c_v + \frac{9}{4}\frac{R}{M}\right) \qquad (1504.2\text{-}2)$$

Because M and c_v are involved in this equation, it is clear, when dissociation effects are considered, that the thermal conductivity of a polyatomic gas is a function of both temperature and pressure. This equation is the basis for the thermal conductivity values listed in Table XIa of report CM-518 (Reference 4) from which table 1510.11b was compiled for this section of the Handbook.

1505 Prandtl Number

A dimensionless property that is involved in heat transfer calculations is the "Prandtl Number", designated by the symbol N_{Pr}. This Prandtl number is defined by

$$N_{Pr} = \frac{\mu c_p}{k} \qquad (1505\text{-}1)$$

where, of course, the three properties on the right must be expressed in consistent units. Since the Prandtl number usually enters into heat transfer calculations as an exponential factor, with one of several exponents, there is included here an abbreviated list of Prandtl numbers along with three different powers that cover fairly well the range of exponents used in practice. These exponents are: 1, 2/3, 1/2 and 1/3.

The values for Prandtl numbers of dry air that appear in this Handbook (Table 1510.12), for the range from 110 to 1000°K, are taken from NBS-NACA Table 2.44 (Reference 5h). The values listed are for a pressure of one atmosphere only.

1506 Dew Point

The dew point of air (that is, the temperature at which a liquid phase of one of the constituents of air first appears as the temperature is lowered) is of interest especially in connection with high-supersonic wind tunnels. (The enormous expansion involved in the production of very high Mach number flow results in cooling to extremely low values.) There is reproduced here a table (Table 1510.13) of the dew point properties of air at each of several temperatures ranging from 70 to 130°K in increments of 10°K. The dew point properties listed are: pressure (p), density (ρ), enthalpy ($H_T - U_o^o$), and entropy (S). The values listed here are reproduced from the University of Wisconsin report CM-472 (Reference 3) which in turn is based on the tables of Landolt-Bronstein (Reference 19), and on data for pure N_2 and O_2, on the assumption that both the liquid and gas phases obey Roault's Law.

1507 Isentropic Changes

In the case of the "perfect" gases whose behaviors are accurately portrayed by the perfect gas laws (e.g., pV/T = constant), it is a simple matter to derive and use equations that are simple in form, and that will represent the changes that occur during isentropic (i.e., constant-entropy) expansions or compressions. However, for the "real" (imperfect) gases it is not possible to derive simple equations that are applicable to isentropic changes. For this reason there were prepared by Hirschfelder and Curtiss a number of constant-entropy tables for air which are representative of the infinite variety of isentropic changes that are possible. These tables were prepared from the original tables of properties of air that appeared in References 3 and 4, and although they are therefore not precisely consistent with the more recent values of the various properties tabulated in this Handbook for temperatures up to 3000°K (5400°R), they are nevertheless the basis for the tables of constant-entropy changes (Table 1510.14) that appear in this Handbook, because no consistent tables are available. Table 1510.14 is identical to the corresponding tables of References 3 and 4, except for the conversion from metric to British Engineering units.

Five-point Lagrangian interpolation techniques were used by Hirschfelder and Curtiss first in determining the value of density-ratio (ρ/ρ_o) corresponding to the chosen value of entropy and of temperature. Because logarithms of the density ratios give a uniform spacing for interpolation, they were used to increase the accuracy of the resulting values. After the values of ρ/ρ_o were determined, the same interpolation procedures were applied to the determination of the corresponding values of pressure, internal energy and velocity of sound, all of which are also tabulated in Table 1510.14.

In addition to the properties enumerated above, there are also included in Table 1510.14 values for the Reimann characteristic σ defined by

$$\sigma = \int_{\rho_1}^{\rho} \left(\frac{a}{\rho}\right)_S d\rho \qquad (1507\text{-}1)$$

where the integration is performed for constant entropy conditions. Since ρ_1 is arbitrary, the Riemann Characteristic thus computed is obviously referred to an arbitrary level. In the Hirschfelder-Curtiss tables reproduced here, the arbitrary level is chosen so that $\sigma = 0$ at a temperature of 273.16°K (0°C or 32°F).

1508 Shock Front Conditions

In the case of the "perfect" gases it is a simple matter to compute the properties on the opposite sides of a normal shock wave. In Section 5 (Volume 2) of this Handbook, there are recorded nine equations relating such properties. These equations are based on the assumption that the ratio of specific heats $\gamma (= c_p/c_v)$ remains constant throughout the passage of the shock wave.

Table 1510.08 of the present section reveals that the ratio of specific heats does not remain constant when pressure, density, temperature, etc. change. Therefore, it is apparent for strong shock waves in which the various properties vary widely, that more realistic results can be obtained only if the change in properties across the shock wave is taken into consideration.

By means of the three basic equations representing conservation of mass, momentum and energy, it can readily be shown that the pressures, densities, and internal energies on the two opposite sides of a normal shock wave are related by the equation

$$p_1 + p_2 = \frac{2(U_2 - U_1)}{\frac{1}{\rho_1} - \frac{1}{\rho_2}} \qquad (1508\text{-}1)$$

where the subscripts 1 and 2 represent conditions on the upstream and downstream sides of the shock wave, respectively.

Omitting virial coefficients above the second, the equation of state (Equation 1500.111-1) can be written

$$p = \frac{RT\rho}{M}(1 + \bar{B}\rho) \qquad (1508\text{-}2)$$

where M is the molecular weight of the air at the state specified by p, V and T; R is the gas constant for air, and $\bar{B} = \frac{B}{M}$. (1508-3)

Combining Equations 1508-1 and 1508-2 one obtains

$$\frac{\rho_2}{\rho_1} = \frac{1}{2\beta}\left(b + \sqrt{b^2 + 4\beta c}\right) \qquad (1508\text{-}4)$$

where

$$c = \frac{p_1 M_2}{\rho_1 RT_2} \qquad (1508\text{-}5)$$

$$b = 1 + \frac{2(U_2 - U_1) M_2}{RT_2} - c \qquad (1508\text{-}6)$$

$$\beta = 1 + \bar{B}_2(\rho_2 - \rho_1) \qquad (1508\text{-}7)$$

Hirschfelder and Curtiss, in the University of Wisconsin Report CM-518 (Reference 4), present a table of shock front conditions that is based on Equation 1508-1. A recursive method as briefly described in the following was resorted to in solving this equation:

First select arbitrary upstream conditions. For example, select values for T_1 and ρ_1/ρ_o. These values fix the value of p_1 and U_1 (cf. Tables 1510.03 and 1510.04).

Also arbitrarily select a value for the down-stream temperature T_2 (greater than T_1). There remains the problem of finding a consistent set of values for p_2, ρ_2, U_2, M_2 and $\bar{B}_2$ that will satisfy Equation 1508-1.

By any one of several methods a "first-guess" value of the density ratio ρ_2/ρ_1 across the shock front is selected. Then by a suitable interpolation procedure the corresponding values of M_2 and U_2 are determined with the aid of Tables 1510.01 and 1510.04. With these values for T_2, ρ_2, U_2, M_2 and $\bar{B}_2$ compute the values of c, b and β by means of Equations 1508-5, 1508-6 and 1508-7 respectively. These values then lead to a value of ρ_2/ρ_1, by use of Equation 1508-4.

If the value of ρ_2/ρ_1 is not identically the same as the "first-guess" value originally selected, it is necessary to repeat the process using the newly derived value as a "second-guess" value for ρ_2/ρ_1. This process is repeated until the computed value of ρ_2/ρ_1 shows no further change as a result of a computation cycle.

Hirschfelder and Curtiss, using the method outlined above, arrived at the values tabulated in Table X of Reference 4. It is this table that is reproduced, after converting to British engineering units, in Table 1510.15 of this Handbook section.

Table 1510.15 also lists values for the velocity u_1 of the shock front with respect to the gas on the low pressure side of the shock. The velocity u_1 can be readily deduced from the equations for the conservation of mass and momentum only, and shown to be

$$u_1 = \left[\left(\frac{\rho_2}{\rho_1}\right)\left(\frac{p_2 - p_1}{\rho_2 - \rho_1}\right)\right]^{1/2} \qquad (1508\text{-}8)$$

This equation was used for computing the values of u_1 in Table X of Reference 4, and it is this set of values for u_1, after converting to British engineering units, that are transcribed in Table 1510.15 of this Handbook section.

Caution should be exercised in the use of Equation 1508-4 and of the values in Table 1510.15 for the high-pressure (down-stream) side of the shock wave. Because of the fact that the probability of transfer of energy from the translational to the vibrational modes of oscillation of the gaseous molecules is very small, a finite time is required for equilibrium conditions to be attained when the temperatures are high enough to excite the vibrational mode. For air the molecular vibrational mode becomes important at about 600°K. Also, a finite time is required for dissociative equilibrium conditions to be attained. For air dissociation becomes important at about 3000°K (Reference 20).

Because of these time delays (sometimes referred to as "relaxation times of specific heats") at temperatures above 600°K, equilibrium conditions may not be reached at the shock front; and therefore, the values listed in Table 1510.15 for the high-pressure side of the shock wave may not apply directly to the shock front. However, it has been shown by Bethe and Teller (Reference 20) that at a sufficient distance down-stream from the front of the shock wave the final equilibrium values are approached asymptotically, and are independent of any intervening phenomena (e.g., "relaxation" phenomena) connected with the approach of statistical equilibrium.

Therefore, the values in Table 1510.15 for the high-pressure side of the shock wave apply accurately only at points sufficiently down-stream from the shock front where the final values have been asymptotically attained.

1509 Reliability

The reliability of the tables in this section of the Handbook depends upon the reliability of the original tables in the three source reports (References 3, 4 and 5 - cf. 1500.3) and upon the accuracy with which the original tables were interpolated and converted to produce the tables in this section. The NBS-NACA tables for dry air are based on what are believed to be the most reliable basic thermodynamic data available at the present time and their reliability is discussed in detail at the end of each table (Reference 5).

The Hirschfelder-Curtiss reports, CM-472 and CM-518 (References 3 and 4) do not contain statements on the reliability of the tables; however, those parts which have not been superseded by NBS-NACA tables (i.e., all moist-air data, molecular weight, shock front conditions, isentropic changes, dew point; and thermal conductivity as a function of pressure) are believed to be the most reliable data of that type yet available.

Conversion to British engineering units was performed for the tables in this section of the Handbook making use of the conversion factors listed in Section 1500.3. It is believed that the error introduced by the conversion process does not exceed five in the last place tabulated (or 0.005 of 1 percent in the case of five significant-figure numbers, whichever is the smaller)

As stated in a preceding section (1500.3), the values for the properties of dry air at temperatures above 3000°K, and also the properties of moist air, were derived from the Hirschfelder tables by interpolation and conversion. The interpolation was performed on digital computing machines and the results were checked by an independent set of computations. As a result, it appears that the interpolation process is accurate to within one or two in the last significant figure. A six-point Lagrangian interpolation method was used, and this tacitly assumes that the function to which the process is applied can be accurately represented by a polynomial equation, in this instance by a fifth-degree polynomial. A study of successive differences of the various properties reveals that for temperatures less than 2000°K for specific heats at constant volume and pressure, less than 3000°K for entropy, and for the ratio of specific heats at all temperatures, the function can be accurately represented by a fourth- or lower-degree polynomial. It is true, however, that at temperatures above these stated values, and for the other properties, the studies of differences reveal that a polynomial of higher degree than the fourth is needed to represent the function with accuracy commensurate with the listed value, but there is no way of determining, from the original tables only, whether or not the fifth-degree polynomial accurately portrays the function.

1510 Tables of Real Properties of Air Dissociated to Chemical Equilibrium (both dry and moist air unless otherwise indicated)

1510.01 Molecular Weight

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
	M	Δ	M Residuals, for mole % moisture content 0.1	1.0	5.0	M	Δ	M Residuals, for mole % moisture content 0.1	1.0	5.0	
700	28.965		-.054	-.109	- .547	28.965		-.054	-.109	- .547	1260
800	28.965	0	-.055	-.109	- .547	28.965	0	-.054	-.109	- .547	1440
900	28.966	1	-.056	-.109	- .548	28.966	1	-.054	-.110	- .547	1620
1000	28.966	0	-.054	-.112	- .549	28.966	0	-.054	-.109	- .548	1800
1100	28.966	0	-.055	-.111	- .548	28.966	0	-.055	-.109	- .548	1980
1200	28.966	0	-.054	-.112	- .548	28.966	0	-.054	-.111	- .548	2160
1300	28.966	0	-.055	-.110	- .548	28.966	0	-.054	-.109	- .548	2340
1400	28.966	0	-.057	-.109	- .547	28.966	0	-.055	-.110	- .548	2520
1500	28.965	- 1	-.056	-.111	- .548	28.965	- 1	-.054	-.109	- .548	2700
1600	28.965	0	-.054	-.111	- .550	28.965	0	-.055	-.108	- .547	2880
1700	28.965	0	-.054	-.112	- .551	28.965	0	-.055	-.110	- .550	3060
1800	28.964	- 1	-.058	-.112	- .555	28.965	0	-.055	-.111	- .552	3240
1900	28.959	- 5	-.059	-.115	- .560	28.963	- 2	-.059	-.114	- .556	3420
2000	28.950	- 9	-.062	-.118	- .567	28.959	- 4	-.060	-.116	- .562	3600
2100	28.935	- 15	-.064	-.126	- .582	28.950	- 9	-.061	-.119	- .569	3780
2200	28.905	- 30	-.072	-.131	- .600	28.936	- 14	-.067	-.124	- .583	3960
2300	28.857	- 48	-.079	-.148	- .630	28.912	- 24	-.071	-.134	- .602	4140
2400	28.777	- 80	-.086	-.159	- .672	28.870	- 42	-.076	-.141	- .625	4320
2500	28.657	-120	-.102	-.181	- .735	28.808	- 62	-.085	-.154	- .661	4500
2600	28.481	-176	-.116	-.209	- .821	28.717	- 91	-.095	-.172	- .708	4680
2700	28.238	-243	-.133	-.242	- .934	28.588	-129	-.107	-.194	- .772	4860
2800	27.920	-318	-.148	-.272	-1.077	28.412	-176	-.121	-.217	- .856	5040
2900	27.523	-397	-.163	-.308	-1.241	28.179	-233	-.132	-.244	- .957	5220
3000	27.056	-467	-.176	-.338	-1.412	27.890	-289	-.147	-.273	-1.081	5400
3100	26.543	-513	-.185			27.544	-346	-.158	-.300	-1.213	5580
3200						27.145	-399	-.169	-.324	-1.355	5760
3300						26.706	-439	-.177	-.345	-1.490	5940
3400						26.245	-461	-.184	-.363	-1.611	6120
3500						25.782	-463	-.190	-.376	-1.715	6300
3600						25.334	-448	-.197	-.388	-1.792	6480
3700						24.911	-423	-.202	-.397	-1.850	6660
3800						24.514	-397	-.204	-.403	-1.885	6840
3900						24.142	-372	-.202	-.402	-1.902	7020
4000						23.782	-360	-.205	-.404	-1.905	7200
4100						23.420	-362	-.202	-.402	-1.892	7390
4200						23.040	-380	-.197	-.394	-1.861	7560
4300						22.632	-408	-.193	-.387	-1.820	7740
4400						22.186	-446	-.187	-.373	-1.769	7920
4500						21.697	-489	-.182	-.360	-1.707	8100
4600						21.169	-528	-.176	-.346	-1.638	8280
4700						20.606	-563	-.166	-.328	-1.563	8460
4800						20.018	-588	-.158	-.312	-1.482	8640
4900						19.414	-604	-.149	-.294	-1.396	8820
5000						18.813	-601	-.140	-.274	-1.309	9000

Table 1510.01 MOLECULAR WEIGHT (M in $slugs/mole_{slug}$) for dry and moist air (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			M Residuals, for mole % moisture content					M Residuals, for mole % moisture content			
	M	Δ	0.1	1.0	5.0	M	Δ	0.1	1.0	5.0	
700	28.965		-.054	-.109	- .547	28.965		-.054	-.109	- .547	1260
800	28.965	0	-.054	-.109	- .547	28.965	0	-.054	-.109	- .547	1440
900	28.966	1	-.054	-.110	- .547	28.966	1	-.054	-.110	- .547	1620
1000	28.966	0	-.054	-.109	- .548	28.966	0	-.054	-.109	- .548	1800
1100	28.966	0	-.055	-.109	- .548	28.966	0	-.055	-.109	- .548	1980
1200	28.966	0	-.054	-.110	- .548	28.966	0	-.054	-.110	- .548	2160
1300	28.966	0	-.054	-.109	- .548	28.966	0	-.054	-.109	- .548	2340
1400	28.966	0	-.054	-.110	- .548	28.966	0	-.054	-.110	- .548	2520
1500	28.966	0	-.054	-.110	- .548	28.966	0	-.054	-.110	- .548	2700
1600	28.965	- 1	-.055	-.107	- .547	28.965	- 1	-.055	-.107	- .547	2880
1700	28.965	0	-.056	-.109	- .549	28.965	0	-.056	-.109	- .549	3060
1800	28.965	0	-.055	-.112	- .551	28.965	0	-.055	-.111	- .551	3240
1900	28.964	- 1	-.059	-.113	- .555	28.964	- 1	-.059	-.113	- .554	3420
2000	28.961	- 3	-.059	-.115	- .561	28.962	- 2	-.059	-.115	- .559	3600
2100	28.954	- 7	-.059	-.117	- .565	28.956	- 6	-.060	-.116	- .564	3780
2200	28.944	- 10	-.066	-.123	- .580	28.948	- 8	-.064	-.122	- .576	3960
2300	28.925	- 19	-.069	-.131	- .594	28.932	- 16	-.068	-.129	- .589	4140
2400	28.894	- 31	-.074	-.137	- .613	28.906	- 26	-.073	-.134	- .607	4320
2500	28.846	- 48	-.080	-.147	- .641	28.866	- 40	-.078	-.144	- .632	4500
2600	28.777	- 69	-.088	-.162	- .679	28.808	- 58	-.084	-.158	- .665	4680
2700	28.677	-100	-.100	-.180	- .730	28.723	- 85	-.096	-.172	- .709	4860
2800	28.540	-137	-.110	-.201	- .798	28.607	-116	-.105	-.192	- .768	5040
2900	28.359	-181	-.123	-.224	- .883	28.453	-154	-.117	-.213	- .844	5220
3000	28.128	-231	-.137	-.250	- .981	28.253	-200	-.130	-.236	- .926	5400
3100	27.844	-284	-.147	-.276	-1.093	28.007	-246	-.139	-.260	-1.027	5580
3200	27.510	-334	-.157	-.299	-1.220	27.712	-295	-.150	-.283	-1.142	5760
3300	27.130	-380	-.166	-.321	-1.350	27.372	-340	-.159	-.306	-1.265	5940
3400	26.715	-415	-.175	-.342	-1.474	26.992	-380	-.168	-.326	-1.385	6120
3500	26.283	-432	-.182	-.357	-1.588	26.588	-404	-.177	-.344	-1.501	6300
3600	25.846	-437	-.189	-.371	-1.682	26.169	-419	-.184	-.359	-1.602	6480
3700	25.421	-425	-.194	-.382	-1.759	25.750	-419	-.188	-.370	-1.688	6660
3800	25.013	-408	-.197	-.392	-1.816	25.343	-407	-.193	-.383	-1.758	6840
3900	24.628	-385	-.201	-.396	-1.856	24.952	-391	-.198	-.390	-1.811	7020
4000	24.258	-370	-.201	-.400	-1.880	24.574	-378	-.198	-.395	-1.849	7200
4100	23.897	-361	-.201	-.401	-1.887	24.210	-364	-.199	-.398	-1.869	7380
4200	23.534	-363	-.200	-.398	-1.878	23.849	-361	-.200	-.398	-1.874	7560
4300	23.158	-376	-.198	-.395	-1.855	23.484	-365	-.200	-.397	-1.864	7740
4400	22.759	-399	-.194	-.385	-1.823	23.105	-379	-.197	-.390	-1.845	7920
4500	22.331	-428	-.190	-.376	-1.779	22.705	-400	-.194	-.383	-1.813	8100
4600	21.869	-462	-.184	-.365	-1.726	22.279	-426	-.188	-.375	-1.770	8280
4700	21.374	-495	-.177	-.351	-1.664	21.823	-456	-.183	-.363	-1.718	8460
4800	20.849	-525	-.171	-.337	-1.596	21.338	-485	-.178	-.351	-1.660	8640
4900	20.298	-551	-.163	-.322	-1.521	20.824	-514	-.170	-.337	-1.592	8820
5000	19.731	-567	-.154	-.302	-1.441	20.289	-535	-.161	-.319	-1.519	9000

Table 1510.01 MOLECULAR WEIGHT (M in $slugs/mole_{slug}$) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	M	Δ	M Residuals, for mole % moisture content 0.1	1.0	5.0	M	Δ	M Residuals, for mole % moisture content 0.1	1.0	5.0	
700	28.965		-.054	-.109	- .547	28.965		-.054	-.109	- .547	1260
800	28.965	0	-.054	-.109	- .547	28.965	0	-.054	-.109	- .547	1440
900	28.966	1	-.054	-.110	- .547	28.966	1	-.056	-.110	- .547	1620
1000	28.966	0	-.054	-.109	- .548	28.966	0	-.055	-.110	- .548	1800
1100	28.966	0	-.055	-.109	- .548	28.966	0	-.055	-.110	- .548	1980
1200	28.966	0	-.054	-.110	- .548	28.965	- 1	-.054	-.109	- .547	2160
1300	28.966	0	-.054	-.109	- .548	28.966	1	-.055	-.110	- .548	2340
1400	28.966	0	-.054	-.110	- .548	28.966	0	-.055	-.110	- .547	2520
1500	28.966	0	-.054	-.11[illegible]	- .548	28.966	0	-.055	-.110	- .548	2700
1600	28.965	- 1	-.055	-.107	- .547	28.966	0	-.054	-.109	- .548	2880
1700	28.965	0	-.056	-.109	- .549	28.965	- 1	-.055	-.109	- .549	3060
1800	28.965	0	-.055	-.111	- .551	28.966	1	-.056	-.111	- .551	3240
1900	28.964	- 1	-.059	-.113	- .554	28.965	- 1	-.057	-.113	- .552	3420
2000	28.962	- 2	-.059	-.115	- .559	28.965	0	-.059	-.114	- .556	3600
2100	28.956	- 6	-.060	-.116	- .564	28.962	- 3	-.060	-.115	- .561	3780
2200	28.948	- 8	-.064	-.122	- .576	28.957	- 5	-.062	-.119	- .566	3960
2300	28.932	- 16	-.068	-.129	- .589	28.949	- 8	-.064	-.122	- .574	4140
2400	28.906	- 26	-.073	-.134	- .607	28.936	- 13	-.068	-.127	- .588	4320
2500	28.866	- 40	-.078	-.144	- .632	28.916	- 20	-.071	-.133	- .603	4500
2600	28.808	- 58	-.084	-.158	- .665	28.887	- 29	-.077	-.142	- .6[illegible]4	4680
2700	28.723	- 85	-.096	-.172	- .709	28.843	- 44	-.084	-.151	- .651	4860
2800	28.607	-116	-.105	-.192	- .768	28.784	- 59	-.090	-.165	- .685	5040
2900	28.453	-154	-.117	-.213	- .844	28.703	- 81	-.099	-.178	- .732	5220
3000	28.253	-200	-.130	-.236	- .926	28.597	-106	-.108	-.194	- .777	5400
3100	28.007	-246	-.139	-.260	-1.027	28.462	-135	-.116	-.212	- .837	5580
3200	27.712	-295	-.150	-.283	-1.142	28.296	-166	-.125	-.231	- .909	5760
3300	27.372	-340	-.159	-.306	-1.265	28.093	-203	-.134	-.250	- .991	5940
3400	26.992	-380	-.168	-.326	-1.385	27.854	-239	-.144	-.270	-1.081	6120
3500	26.588	-404	-.177	-.344	-1.501	27.581	-273	-.153	-.288	-1.178	6300
3600	26.169	-419	-.184	-.359	-1.602	27.275	-306	-.158	-.305	-1.276	6480
3700	25.750	-419	-.188	-.370	-1.688	26.940	-335	-.164	-.318	-1.371	6660
3800	25.343	-407	-.193	-.383	-1.758	26.588	-352	-.171	-.334	-1.465	6840
3900	24.952	-391	-.198	-.390	-1.811	26.226	-362	-.178	-.348	-1.551	7020
4000	24.574	-378	-.198	-.395	-1.849	25.858	-368	-.181	-.358	-1.627	7200
4100	24.210	-364	-.199	-.398	-1.869	25.495	-363	-.186	-.368	-1.688	7380
4200	23.849	-361	-.200	-.398	-1.874	25.136	-359	-.191	-.377	-1.741	7560
4300	23.484	-365	-.200	-.397	-1.864	24.784	-352	-.193	-.382	-1.780	7740
4400	23.105	-379	-.197	-.390	-1.845	24.438	-346	-.196	-.387	-1.807	7920
4500	22.705	-400	-.194	-.383	-1.813	24.093	-345	-.196	-.389	-1.823	8100
4600	22.279	-426	-.188	-.375	-1.770	23.744	-349	-.191	-.388	-1.826	8280
4700	21.823	-456	-.183	-.363	-1.718	23.389	-355	-.194	-.387	-1.819	8460
4800	21.338	-485	-.178	-.351	-1.660	23.021	-368	-.195	-.383	-1.803	8640
4900	20.824	-514	-.170	-.337	-1.592	22.636	-385	-.189	-.376	-1.774	8820
5000	20.289	-535	-.161	-.319	-1.519	22.233	-403	-.183	-.368	-1.740	9000

Table 1510.01 MOLECULAR WEIGHT (M in $slugs/mole_{slug}$) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			M Residuals, for mole % moisture content					M Residuals, for mole % moisture content			
	M	Δ	0.1	1.0	5.0	M	Δ	0.1	1.0	5.0	
700	28.965		-.054	-.109	- .547	28.965		-.054	-.109	- .547	1260
800	28.965	1	-.055	-.110	- .547	28.966	1	-.055	-.110	- .547	1440
900	28.966	0	-.056	-.110	- .547	28.967	1	-.057	-.111	- .548	1620
1000	28.966	0	-.055	-.110	- .548	28.966	- 1	-.055	-.110	- .548	1800
1100	28.966	0	-.055	-.110	- .548	28.966	0	-.055	-.111	- .548	1980
1200	28.965	- 1	-.054	-.109	- .547	28.966	0	-.055	-.109	- .547	2160
1300	28.966	1	-.055	-.110	- .548	28.966	0	-.055	-.110	- .548	2340
1400	28.966	0	-.055	-.110	- .547	28.966	0	-.055	-.110	- .547	2520
1500	28.966	0	-.055	-.110	- .548	28.966	0	-.055	-.110	- .548	2700
1600	28.966	0	-.054	-.110	- .548	28.966	0	-.054	-.111	- .548	2880
1700	28.965	- 1	-.054	-.109	- .549	28.965	- 1	-.054	-.109	- .549	3060
1800	28.966	1	-.056	-.111	- .550	28.966	1	-.056	-.111	- .550	3240
1900	28.966	0	-.057	-.113	- .552	28.966	0	-.056	-.112	- .551	3420
2000	28.965	- 1	-.059	-.113	- .555	28.965	- 1	-.057	-.112	- .554	3600
2100	28.964	- 1	-.059	-.115	- .560	28.965	0	-.059	-.115	- .559	3780
2200	28.959	- 5	-.060	-.116	- .562	28.960	- 5	-.060	-.116	- .562	3960
2300	28.954	- 5	-.064	-.120	- .571	28.955	- 5	-.062	-.119	- .569	4140
2400	28.944	- 10	-.065	-.124	- .582	28.947	- 8	-.064	-.123	- .579	4320
2500	28.928	- 16	-.069	-.130	- .595	28.935	- 12	-.068	-.128	- .591	4500
2600	28.906	- 22	-.073	-.137	- .613	28.916	- 19	-.072	-.135	- .607	4680
2700	28.873	- 33	-.080	-.145	- .635	28.888	- 28	-.077	-.142	- .626	4860
2800	28.828	- 45	-.085	-.156	- .662	28.850	- 33	-.082	-.152	- .649	5040
2900	28.766	- 62	-.092	-.168	- .699	28.799	- 51	-.089	-.162	- .681	5220
3000	28.685	- 81	-.101	-.182	- .738	28.730	- 69	-.097	-.176	- .718	5400
3100	28.581	-104	-.109	-.198	- .787	28.642	- 88	-.105	-.189	- .761	5580
3200	28.451	-130	-.117	-.214	- .845	28.531	-111	-.113	-.204	- .812	5760
3300	28.291	-160	-.124	-.231	- .912	28.394	-137	-.120	-.220	- .871	5940
3400	28.100	-191	-.133	-.249	- .987	28.230	-164	-.128	-.237	- .938	6120
3500	27.878	-222	-.142	-.266	-1.070	28.037	-193	-.135	-.253	-1.011	6300
3600	27.624	-254	-.148	-.283	-1.157	27.815	-222	-.142	-.269	-1.088	6480
3700	27.340	-284	-.155	-.297	-1.247	27.563	-252	-.149	-.284	-1.173	6660
3800	27.031	-309	-.161	-.313	-1.337	27.287	-276	-.155	-.299	-1.259	6840
3900	26.706	-325	-.168	-.326	-1.425	26.989	-298	-.161	-.312	-1.343	7020
4000	26.366	-340	-.172	-.338	-1.505	26.674	-315	-.167	-.325	-1.424	7200
4100	26.023	-343	-.178	-.350	-1.576	26.350	-324	-.172	-.338	-1.499	7380
4200	25.676	-347	-.183	-.359	-1.641	26.017	-333	-.178	-.347	-1.567	7560
4300	25.334	-342	-.186	-.367	-1.695	25.684	-333	-.181	-.356	-1.629	7740
4400	24.995	-339	-.190	-.375	-1.738	25.352	-332	-.184	-.365	-1.679	7920
4500	24.658	-337	-.191	-.380	-1.770	25.022	-330	-.187	-.372	-1.720	8100
4600	24.323	-335	-.190	-.383	-1.790	24.693	-329	-.188	-.376	-1.752	8280
4700	23.985	-338	-.193	-.384	-1.801	24.362	-331	-.191	-.380	-1.773	8460
4800	23.643	-342	-.194	-.384	-1.803	24.032	-330	-.193	-.382	-1.786	8640
4900	23.290	-353	-.191	-.380	-1.792	23.693	-339	-.191	-.380	-1.787	8820
5000	22.925	-365	-.188	-.377	-1.776	23.345	-348	-.190	-.379	-1.781	9000

Table 1510.01 MOLECULAR WEIGHT (M in slugs/mole$_{slug}$) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			M Residuals, for mole % moisture content					M Residuals, for mole % moisture content			
	M	Δ	0.1	1.0	5.0	M	Δ	0.1	1.0	5.0	
700	28.965		-.054	-.109	- .547	28.965		-.054	-.109	- .547	1260
800	28.966	1	-.055	-.110	- .547	28.968	3	-.057	-.112	- .549	1440
900	28.967	1	-.057	-.111	- .548	28.967	- 1	-.054	-.111	- .548	1620
1000	28.966	- 1	-.055	-.110	- .548	28.966	- 1	-.055	-.109	- .547	1800
1100	28.966	0	-.055	-.111	- .548	28.966	0	-.055	-.109	- .547	1980
1200	28.966	0	-.055	-.109	- .547	28.968	2	-.057	-.112	- .551	2160
1300	28.966	0	-.055	-.110	- .548	28.966	- 2	-.055	-.109	- .547	2340
1400	28.966	0	-.055	-.110	- .547	28.967	1	-.056	-.111	- .549	2520
1500	28.966	0	-.055	-.110	- .548	28.966	- 1	-.054	-.109	- .548	2700
1600	28.966	0	-.054	-.111	- .548	28.966	0	-.054	-.109	- .547	2880
1700	28.965	- 1	-.054	-.109	- .549	28.967	1	-.055	-.110	- .548	3060
1800	28.966	1	-.056	-.111	- .550	28.967	0	-.055	-.111	- .549	3240
1900	28.966	0	-.056	-.112	- .551	28.967	0	-.056	-.111	- .551	3420
2000	28.965	- 1	-.057	-.112	- .554	28.966	- 1	-.056	-.112	- .551	3600
2100	28.965	0	-.059	-.115	- .559	28.966	0	-.057	-.114	- .555	3780
2200	28.960	- 5	-.060	-.116	- .562	28.965	- 1	-.059	-.114	- .559	3960
2300	28.955	- 5	-.062	-.119	- .569	28.962	- 3	-.059	-.116	- .563	4140
2400	28.947	- 8	-.064	-.123	- .579	28.957	- 5	-.061	-.119	- .569	4320
2500	28.935	- 12	-.068	-.128	- .591	28.952	- 5	-.064	-.123	- .578	4500
2600	28.916	- 19	-.072	-.135	- .607	28.942	- 10	-.067	-.128	- .588	4680
2700	28.888	- 28	-.077	-.142	- .626	28.928	- 14	-.071	-.133	- .601	4860
2800	28.850	- 38	-.082	-.152	- .649	28.909	- 19	-.074	-.139	- .616	5040
2900	28.799	- 51	-.089	-.162	- .681	28.883	- 26	-.078	-.146	- .636	5220
3000	28.730	- 69	-.097	-.176	- .718	28.848	- 35	-.085	-.156	- .659	5400
3100	28.642	- 88	-.105	-.189	- .761	28.802	- 46	-.091	-.165	- .687	5580
3200	28.531	-111	-.113	-.204	- .812	28.743	- 59	-.096	-.176	- .719	5760
3300	28.394	-137	-.120	-.220	- .871	28.670	- 73	-.103	-.186	- .756	5940
3400	28.230	-164	-.128	-.237	- .938	28.580	- 90	-.108	-.198	- .796	6120
3500	28.037	-193	-.135	-.253	-1.011	28.475	-105	-.115	-.212	- .843	6300
3600	27.815	-222	-.142	-.269	-1.088	28.351	-124	-.121	-.224	- .891	6480
3700	27.563	-252	-.149	-.284	-1.173	28.209	-142	-.128	-.238	- .947	6660
3800	27.287	-276	-.155	-.299	-1.259	28.045	-164	-.134	-.250	-1.003	6840
3900	26.989	-298	-.161	-.312	-1.343	27.863	-182	-.138	-.261	-1.068	7020
4000	26.674	-315	-.167	-.325	-1.424	27.659	-204	-.144	-.273	-1.131	7200
4100	26.350	-324	-.172	-.338	-1.499	27.436	-223	-.149	-.286	-1.198	7380
4200	26.017	-333	-.178	-.347	-1.567	27.192	-244	-.154	-.296	-1.263	7560
4300	25.684	-333	-.181	-.356	-1.629	26.936	-256	-.159	-.307	-1.330	7740
4400	25.352	-332	-.184	-.365	-1.679	26.663	-273	-.160	-.316	-1.393	7920
4500	25.022	-330	-.187	-.372	-1.720	26.382	-281	-.167	-.327	-1.455	8100
4600	24.693	-329	-.188	-.376	-1.752	26.094	-288	-.172	-.336	-1.509	8280
4700	24.362	-331	-.191	-.380	-1.773	25.800	-294	-.175	-.344	-1.562	8460
4800	24.032	-330	-.193	-.382	-1.786	25.504	-296	-.176	-.350	-1.605	8640
4900	23.693	-339	-.191	-.380	-1.787	25.205	-299	-.181	-.356	-1.643	8820
5000	23.345	-348	-.190	-.379	-1.781	24.900	-305	-.183	-.361	-1.673	9000

Table 1510.01 MOLECULAR WEIGHT (M in $slugs/mole_{slug}$) for dry and moist air (Continued) (See Section 150 .3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
	M	Δ	M Residuals, for mole % moisture content 0.1	1.0	5.0	M	Δ	M Residuals, for mole % moisture content 0.1	1.0	5.0	
800	28.966		-.056	-.110	- .547						1440
900	28.967	1	-.055	-.110	- .548						1620
1000	28.966	- 1	-.055	-.109	- .547						1800
1100	28.967	1	-.056	-.110	- .548	28.967		-.056	-.111	- .548	1980
1200	28.968	1	-.057	-.112	- .550	28.968	1	-.057	-.111	- .550	2160
1300	28.966	- 2	-.054	-.109	- .547	28.967	- 1	-.055	-.110	- .547	2340
1400	28.968	2	-.056	-.113	- .550	28.967	0	-.055	-.112	- .548	2520
1500	28.966	- 2	-.053	-.109	- .548	28.967	0	-.054	-.110	- .548	2700
1600	28.966	0	-.055	-.109	- .547	28.966	- 1	-.055	-.108	- .547	2880
1700	28.968	2	-.056	-.110	- .548	28.968	2	-.056	-.110	- .548	3060
1800	28.967	- 1	-.054	-.110	- .548	28.968	0	-.054	-.111	- .549	3240
1900	28.967	0	-.056	-.110	- .551	28.967	- 1	-.056	-.110	- .550	3420
2000	28.967	0	-.055	-.112	- .551	28.968	1	-.055	-.112	- .551	3600
2100	28.966	- 1	-.055	-.112	- .552	28.967	- 1	-.055	-.112	- .551	3780
2200	28.966	0	-.059	-.114	- .559	28.967	0	-.058	-.115	- .558	3960
2300	28.964	- 2	-.058	-.116	- .561	28.965	- 2	-.057	-.115	- .560	4140
2400	28.960	- 4	-.060	-.118	- .566	28.962	- 3	-.060	-.117	- .565	4320
2500	28.956	- 4	-.063	-.122	- .574	28.958	- 4	-.061	-.120	- .571	4500
2600	28.949	- 7	-.064	-.125	- .582	28.952	- 6	-.064	-.124	- .579	4680
2700	28.939	- 10	-.069	-.130	- .594	28.944	- 8	-.069	-.128	- .589	4860
2800	28.924	- 15	-.072	-.136	- .608	28.933	- 11	-.071	-.135	- .604	5040
2900	28.903	- 21	-.075	-.141	- .625	28.914	- 19	-.073	-.139	- .620	5220
3000	28.878	- 25	-.082	-.150	- .641	28.894	- 20	-.081	-.147	- .631	5400
3100	28.843	- 35	-.085	-.157	- .665	28.864	- 30	-.082	-.152	- .653	5580
3200	28.799	- 44	-.090	-.167	- .691	28.828	- 36	-.087	-.162	- .676	5760
3300	28.743	- 56	-.096	-.176	- .721	28.783	- 45	-.093	-.170	- .702	5940
3400	28.675	- 68	-.102	-.185	- .756	28.726	- 57	-.100	-.180	- .733	6120
3500	28.594	- 81	-.110	-.200	- .796	28.657	- 69	-.106	-.193	- .769	6300
3600	28.496	- 98	-.115	-.210	- .838	28.572	- 85	-.111	-.203	- .809	6480
3700	28.381	-115	-.120	-.221	- .883	28.471	-101	-.115	-.212	- .849	6660
3800	28.250	-131	-.126	-.233	- .932	28.356	-115	-.121	-.224	- .893	6840
3900	28.103	-147	-.131	-.245	- .987	28.225	-131	-.126	-.235	- .945	7020
4000	27.937	-166	-.136	-.256	-1.042	28.079	-146	-.130	-.246	- .996	7200
4100	27.754	-183	-.140	-.266	-1.099	27.917	-162	-.135	-.255	-1.046	7380
4200	27.554	-200	-.145	-.278	-1.159	27.743	-174	-.140	-.268	-1.101	7560
4300	27.338	-216	-.149	-.288	-1.217	27.555	-188	-.145	-.277	-1.154	7740
4400	27.106	-232	-.153	-.297	-1.277	27.351	-204	-.149	-.286	-1.211	7920
4500	26.862	-244	-.158	-.307	-1.338	27.135	-216	-.152	-.295	-1.268	8100
4600	26.607	-255	-.163	-.316	-1.393	26.906	-229	-.155	-.303	-1.320	8280
4700	26.343	-264	-.166	-.324	-1.447	26.666	-240	-.159	-.311	-1.374	8460
4800	26.072	-271	-.168	-.332	-1.497	26.417	-249	-.163	-.319	-1.424	8640
4900	25.795	-277	-.172	-.338	-1.542	26.160	-257	-.166	-.326	-1.470	8820
5000	25.511	-284	-.175	-.345	-1.582	25.893	-267	-.169	-.334	-1.514	9000

Table 1510.01 MOLECULAR WEIGHT (M in $slugs/mole_{slug}$) for dry and moist air (Concluded) (See Section 1500.3 for definition of residuals)

Table 1510.02 Second Virial Coefficient (dry air)

T (°K)	B	Δ	T (°R)	T (°K)	B	Δ	T (°R)
100	-2.7249		180	1700	.54507	391	3060
120	-1.9726		216	1800	.54815	308	3240
140	-1.4803		252	1900	.55053	238	3420
150	-1.2932		270	2000	.55237	184	3600
160	-1.1339		288	2100	.55375	138	3780
180	- .87745		324	2200	.55475	100	3960
200	- .68040	20445	360	2300	.55541	66	4140
220	- .52450		396	2400	.55583	42	4320
250	- .34367		450	2500	.55601	18	4500
273.16	- .23521		491.69	2600	.55601		4680
280	- .20705		504	2700	.55583	- 18	4860
300	- .13809	54731	540	2800	.55553	- 30	5040
350	.01023		630	2900	.55511	- 42	5220
400	.11328	24637	720	3000	.55457	- 54	5400
450	.19040		810	3100	.55397	- 60	5580
500	.24365	13667	900	3200	.55327	- 70	5760
540	.28845		972	3300	.55251	- 76	5940
550	.29826		990	3400	.55171	- 80	6120
580	.32274		1044	3500	.55083	- 88	6300
600	.33405	8500	1080	3600	.54993	- 90	6480
630	.35432		1134	3700	.54900	- 93	6660
650	.36605		1170	3800	.54804	- 96	6840
660	.37161		1188	3900	.54705	- 99	7020
700	.39186	5691	1260	4000	.54605	- 100	7200
750	.41351		1350	4100	.54503	- 102	7380
800	.43184	3998	1440	4200	.54398	- 105	7560
900	.46093	2911	1620	4300	.54294	- 104	7740
1000	.48269	2174	1800	4400	.54189	- 105	7920
1100	.49927	1658	1980	4500	.54082	- 107	8100
1200	.51246	1281	2160	4600	.53975	- 107	8280
1300	.52210	1002	2340	4700	.53868	- 107	8460
1400	.53002	792	2520	4800	.53762	- 106	8640
1500	.53623	621	2700	4900	.53653	- 109	8820
1600	.54116	493	2880	5000	.53546	- 107	9000

Table 1510.02 SECOND VIRIAL COEFFICIENT (B in $ft^3/slug$) for dry air

Conversion Factors for Second Virial Coefficient (B)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
B	B	$ft^4\ lb_F^{-1}\ sec^{-2}$	1.00000
with dimensions of $ft^3\ slug^{-1}$		$ft^3\ lb_M^{-1}$	0.0310810
		$ft^3\ mole_{lb}^{-1}$	0.900293
		$in^3\ lb_M^{-1}$	53.7080
		$in^3\ mole_{lb}^{-1}$	1555.71
		$cm^3\ gm^{-1}$	1.94034
		$cm^3\ mole_{gm}^{-1}$	56.2038
		$M^3\ kgm^{-1}$	1.94034×10^{-3}

Table 1510.02 SECOND VIRIAL COEFFICIENT (B in ft^3/slug) for dry air (Concluded)

1510.03 Density

0.01 Atmosphere Pressure							
T (°K)	ρ x10^5	$-\Delta$	T (°R)	T (°K)	ρ x10^5	$-\Delta$	T (°R)
50	13.716		90	300	2.2832	785	540
60	11.424	2292	108	310	2.2094	738	558
70	9.7895	1634	126	320	2.1404	690	576
80	8.5644	12251	144	330	2.0754	650	594
90	7.6122	9522	162	340	2.0145	609	612
100	6.8505	7617	180	350	1.9570	575	630
110	6.2275	6230	198	360	1.9026	544	648
120	5.7084	5191	216	370	1.8511	515	666
130	5.2691	4393	234	380	1.8024	487	684
140	4.8927	3764	252	390	1.7563	461	702
150	4.5663	3264	270	400	1.7124	439	720
160	4.2811	2852	288	410	1.6705	419	738
170	4.0292	2519	306	420	1.6308	397	756
180	3.8054	2238	324	430	1.5929	379	774
190	3.6049	2005	342	440	1.5566	363	792
200	3.4247	1802	360	450	1.5219	347	810
210	3.2617	1630	378	460	1.4891	328	828
220	3.1134	1483	396	470	1.4572	319	846
230	2.9779	1355	414	480	1.4269	303	864
240	2.8540	1239	432	490	1.3977	292	882
250	2.7398	1142	450	500	1.3699	278	900
260	2.6344	1054	468	510	1.3431	268	918
270	2.5368	976	486	520	1.3172	259	936
280	2.4462	906	504	530	1.2924	248	954
290	2.3617	845	522	540	1.2683	241	972

Moisture residuals at 300°K(540°R)

Mole % moisture content	0.5	1.0	5.0
ρ Residuals	0.000	0.000	0.000

Conversion Factors for Density (ρ)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
ρ x10^5	ρ x10^5	$lb_F\ sec^2\ ft^{-4}$	1.00000
with dimensions of slug ft^{-3}		$lb_M\ ft^{-3}$	32.1740
		$lb_M\ in^{-3}$	0.0186192
		$gm\ cm^{-3}$	0.515375
		$kgm\ m^{-3}$	515.375

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air
(See Section 1500.3 for definition of residuals)

0.01 Atmosphere Pressure							
T (°K)	ρ x10^5	-Δ	T (°R)	T (°K)	ρ x10^5	-Δ	T (°R)
550	1.2452	231	990	800	.8561	110	1440
560	1.2231	221	1008	850	.8059	502	1530
570	1.2015	216	1026	900	.7610	449	1620
580	1.1810	205	1044	950	.7211	399	1710
590	1.1609	201	1062	1000	.6849	362	1800
600	1.1416	193	1080	1050	.6523	326	1890
610	1.1228	188	1098	1100	.6227	296	1980
620	1.1047	181	1116	1150	.5956	271	2070
630	1.0871	176	1134	1200	.5708	248	2160
640	1.0701	170	1152	1250	.5480	228	2250
650	1.0538	163	1170	1300	.5269	211	2340
660	1.0377	161	1188	1350	.5073	196	2430
670	1.0222	155	1206	1400	.4892	181	2520
680	1.0071	151	1224	1450	.4724	168	2610
690	.9925	146	1242	1500	.4566	158	2700
700	.9785	140	1260	1550	.4418	148	2790
710	.9647	138	1278	1600	.4280	138	2880
720	.9512	135	1296	1650	.4150	130	2970
730	.9384	128	1314	1700	.4029	121	3060
740	.9256	128	1332	1750	.3914	115	3150
750	.9133	123	1350	1800	.3804	110	3240
760	.9012	121	1368	1850	.3701	103	3330
770	.8894	118	1386	1900	.3603	98	3420
780	.8781	113	1404	1950	.3508	95	3510
790	.8671	110	1422	2000	.3420	88	3600
				2050	.3332	88	3690
				2100	.3252	80	3780
				2150	.3171	81	3870
				2200	.3094	77	3960
				2250	.3018	76	4050
				2300	.2943	75	4140

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0.	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	
80	85.910										144
90	76.293	9617				307.51					162
100	68.623	7670				276.04	3147				180
110	62.355	6268				250.51	2553				198
120	57.142	5213				229.34	2117				216
130	52.734	4408				211.51	1783				234
140	48.958	3776				196.26	1525				252
150	45.688	3270				183.08	1318				270
160	42.828	2860				171.56	1152				288
170	40.307	2521				161.42	1014				306
180	38.064	2243				152.41	901				324
190	36.059	2005				144.36	805				342
200	34.255	1804				137.11	725				360
210	32.622	1633				130.56	655				378
220	31.139	1483				124.61	595				396
230	29.784	1355				119.18	543				414
240	28.542	1242				114.21	497				432
250	27.400	1142				109.63	458				450
260	26.344	1056				105.40	423				468
270	25.368	976				101.50	390				486
280	24.462	906				97.865	363				504
290	23.619	843				94.488	3377				522
300	22.832	787	.035	.088	.428	91.334	3154	.136	.351	1.700	540
310	22.094	738				88.383	2951				558
320	21.404	690				85.621	2762				576
330	20.754	650				83.022	2599				594
340	20.145	609				80.581	2441				612
350	19.570	575				78.275	2306				630
360	19.026	544				76.100	2175				648
370	18.511	515				74.042	2058				666
380	18.024	487				72.093	1949				684
390	17.563	461				70.244	1849				702
400	17.124	439	.026	.065	.319	68.487	1757	.101	.257	1.271	720
410	16.705	419				66.814	1673				738
420	16.308	397				65.223	1591				756
430	15.927	381				63.708	1515				774
440	15.566	361				62.258	1450				792
450	15.219	347				60.875	1383				810
460	14.888	331				59.550	1325				828
470	14.572	316				58.283	1267				846
480	14.269	303				57.069	1214				864
490	13.977	292				55.905	1164				882
500	13.699	278	.021	.052	.256	54.786	1119	.082	.209	1.022	900
510	13.431	268				53.712	1074				918
520	13.172	259				52.678	1034				936
530	12.924	248				51.685	993				954
540	12.683	241				50.726	959				972

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of Residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			ρ Residuals, for mole % moisture content					ρ Residuals, for mole % moisture content			
	ρ x10^5	-Δ	0.1	1.0	5.0	ρ x10^5	-Δ	0.1	1.0	5.0	
90	542.36					781.07					162
100	485.89	5647				698.25	8282				180
110	440.32	4557				631.86	6639				198
120	402.74	3758				577.34	5452				216
130	371.15	3159				531.68	4566				234
140	344.21	2694				492.81	3887				252
150	320.97	2324				459.34	3347				270
160	300.67	2030				430.16	2918				288
170	282.84	1783				404.52	2564				306
180	266.98	1586				381.79	2273				324
190	252.83	1415				361.49	2030				342
200	240.11	1272				343.25	1824				360
210	228.62	1149				326.79	1646				378
220	218.18	1044				311.84	1495				396
230	208.65	953				298.19	1365				414
240	199.91	874				285.77	1242				432
250	191.91	800				274.23	1154				450
260	184.51	740				263.64	1059				468
270	177.66	685				253.83	981				486
280	171.29	637				244.75	908				504
290	165.37	592				236.27	848				522
300	159.85	552	.23	.61	2.96	228.37	790	.33	.86	4.22	540
310	154.68	517				220.99	738				558
320	149.84	484				214.07	692				576
330	145.29	455				207.57	650				594
340	141.03	426				201.45	612				612
350	136.99	404				195.70	575				630
360	133.18	381				190.26	544				648
370	129.56	362				185.09	517				666
380	126.15	341				180.22	487				684
390	122.91	324				175.60	462				702
400	119.85	306	.18	.45	2.23	171.19	441	.25	.64	3.18	720
410	116.92	293				167.02	417				738
420	114.13	279				163.03	399				756
430	111.47	266				159.24	379				774
440	108.94	253				155.63	361				792
450	106.53	241				152.17	346				810
460	104.20	233				148.86	331				828
470	101.99	221				145.70	316				846
480	99.86	213				142.63	307				864
490	97.82	204				139.72	291				882
500	95.87	195	.14	.37	1.78	136.94	278	.20	.52	2.54	900
510	93.99	188				134.25	269				918
520	92.18	181				131.67	258				936
530	90.45	173				129.19	248				954
540	88.77	168				126.80	239				972

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure: ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	0.4 Atmosphere Pressure: ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	T (°R)
550	12.452	231				49.806	920				990
560	12.231	221				48.915	891				1008
570	12.015	216				48.057	858				1026
580	11.807	208				47.229	828				1044
590	11.609	198				46.428	801				1062
600	11.416	193	.017	.043	.213	45.653	775	.071	.177	.847	1080
610	11.228	188				44.906	747				1098
620	11.047	181				44.180	726				1116
630	10.871	176				43.480	700				1134
640	10.701	170				42.801	679				1152
650	10.538	163				42.143	658				1170
660	10.377	161				41.503	640				1188
670	10.222	155				40.884	619				1206
680	10.071	151				40.284	600				1224
690	9.925	146				39.699	585				1242
700	9.785	140	.015	.037	.183	39.132	567	.061	.151	.734	1260
710	9.647	138				38.580	552				1278
720	9.512	135				38.046	534				1296
730	9.381	131				37.524	522				1314
740	9.256	125				37.017	507				1332
750	9.133	123				36.523	494				1350
760	9.012	121				36.044	479				1368
770	8.894	118				35.575	469				1386
780	8.781	113				35.118	457				1404
790	8.668	113				34.674	444				1422
800	8.5611	107	.0133	.0324	.1602	34.240	434	.050	.132	.640	1440
850	8.0576	5035				32.228	2012				1530
900	7.6100	4476	.0115	.0292	.1420	30.436	1792	.047	.120	.572	1620
950	7.2095	4005				28.836	1600				1710
1000	6.8490	3605	.0101	.0258	.1279	27.393	1443	.040	.106	.513	1800
1050	6.5228	3262				26.088	1305				1890
1100	6.2263	2965	.0089	.0236	.1158	24.904	1184	.038	.095	.464	1980
1150	5.9555	2708				23.820	1084				2070
1200	5.7074	2481	.0085	.0220	.1064	22.829	991	.035	.089	.427	2160
1250	5.4791	2283				21.916	913				2250
1300	5.2683	2108	.0079	.0201	.0983	21.073	843	.032	.081	.395	2340
1350	5.0734	1949				20.293	780				2430
1400	4.8922	1812	.0076	.0184	.0913	19.567	726	.030	.075	.366	2520
1450	4.7234	1688				18.893	674				2610
1500	4.5661	1573	.0068	.0171	.0850	18.263	630	.029	.071	.343	2700
1550	4.4193	1468				17.673	590				2790
1600	4.2813	1380	.0056	.0163	.0797	17.121	552	.028	.065	.322	2880
1650	4.1513	1300				16.602	519				2970
1700	4.0289	1224	.0060	.0153	.0755	16.115	487	.025	.062	.304	3060
1750	3.9135	1154				15.653	462				3150

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			ρ Residuals, for mole % moisture content					ρ Residuals, for mole % moisture content			
	ρ x10^5	-Δ	0.1	1.0	5.0	ρ x10^5	-Δ	0.1	1.0	5.0	
550	87.16	161				124.50	230				990
560	85.61	155				122.26	224				1008
570	84.10	151				120.10	216				1026
580	82.65	145				118.05	205				1044
590	81.24	141				116.04	201				1062
600	79.89	135	.12	.31	1.48	114.11	193	.17	.44	2.12	1080
610	78.58	131				112.25	186				1098
620	77.30	128				110.42	183				1116
630	76.07	123				108.69	173				1134
640	74.893	118				106.98	171				1152
650	73.741	1152				105.33	165				1170
660	72.622	1119				103.75	158				1188
670	71.538	1084				102.19	156				1206
680	70.487	1051				100.68	151				1224
690	69.466	1021				99.23	145				1242
700	68.472	994	.106	.262	1.281	97.80	143	.15	.37	1.83	1260
710	67.511	961				96.42	138				1278
720	66.571	940				95.09	133				1296
730	65.660	911				93.79	130				1314
740	64.772	888				92.53	126				1332
750	63.908	864				91.30	123				1350
760	63.068	840				90.10	120				1368
770	62.250	818				88.92	118				1386
780	61.452	798				87.79	113				1404
790	60.672	780				86.66	113				1422
800	59.914	758	.090	.232	1.119	85.58	108	.13	.33	1.59	1440
850	56.392	3522				80.56	502				1530
900	53.258	3134	.082	.209	.998	76.07	449	.11	.29	1.42	1620
950	50.455	2803				72.073	400				1710
1000	47.934	2521	.074	.188	.897	68.470	3603	.103	.267	1.278	1800
1050	45.651	2283				65.211	3259				1890
1100	43.576	2075	.067	.169	.811	62.245	2966	.094	.238	1.155	1980
1150	41.682	1894				59.540	2705				2070
1200	39.945	1737	.062	.155	.746	57.059	2481	.086	.221	1.064	2160
1250	38.347	1598				54.778	2281				2250
1300	36.874	1473	.057	.143	.692	52.671	2107	.079	.201	.985	2340
1350	35.507	1367				50.721	1950				2430
1400	34.240	1267	.053	.132	.640	48.910	1811	.076	.189	.913	2520
1450	33.058	1182				47.224	1686				2610
1500	31.957	1101	.052	.126	.601	45.651	1573	.071	.182	.857	2700
1550	30.926	1031				44.178	1473				2790
1600	29.960	966	.051	.113	.563	42.798	1380	.074	.161	.804	2880
1650	29.051	909				41.501	1297				2970
1700	28.198	853	.044	.109	.531	40.279	1222	.062	.156	.757	3060
1750	27.393	805				39.130	1149				3150

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			ρ Residuals, for mole % moisture content					ρ Residuals, for mole % moisture content			
	ρ x10^5	-Δ	0.1	1.0	5.0	ρ x10^5	-Δ	0.1	1.0	5.0	
1800	3.8046	1089	.0062	.0150	.0719	15.219	434	.024	.059	.287	3240
1850	3.7017	1029				14.808	411				3330
1900	3.6039	978	.0058	.0144	.0686	14.417	391	.024	.057	.274	3420
1950	3.5111	928				14.045	372				3510
2000	3.4227	884	.0058	.0143	.0662	13.694	351	.023	.055	.262	3600
2050	3.3384	843				13.358	336				3690
2100	3.2579	805	.0058	.0141	.0644	13.037	321	.023	.055	.255	3780
2150	3.1806	773				12.731	306				3870
2200	3.1066	740	.0066	.0143	.0636	12.439	292	.024	.054	.248	3960
2250	3.0356	710				12.158	281				4050
2300	2.9669	687	.0068	.0147	.0639	11.887	271	.025	.055	.245	4140
2350	2.9001	668				11.629	258				4230
2400	2.8354	647	.0074	.0158	.0652	11.378	251	.026	.056	.244	4320
2450	2.7722	632				11.135	243				4410
2500	2.7104	618	.0085	.0173	.0686	10.899	236	.028	.058	.248	4500
2550	2.6500	604				10.671	228				4590
2600	2.5905	595	.0095	.0192	.0739	10.447	224	.031	.063	.256	4680
2650	2.5316	589				10.229	218				4770
2700	2.4731	585	.0106	.0213	.0811	10.016	213	.034	.068	.268	4860
2750	2.4154	577				9.808	208				4950
2800	2.3579	575	.0116	.0233	.0904	9.802	206	.037	.073	.287	5040
2850	2.3010	569				9.399	203				5130
2900	2.2445	565	.0124	.0253	.1005	9.198	201	.040	.080	.310	5220
2950	2.1886	559				9.000	198				5310
3000	2.1336	550	.0130	.0268	.1109	8.804	196	.043	.086	.339	5400
3100	2.0245	1078	.0134			8.4024	3894	.0451	.0915	.3682	5580
3200						8.0221	3803	.0468	.0955	.3984	5760
3300						7.6530	3691	.0479	.0986	.4255	5940
3400						7.2998	3532	.0484	.1007	.4465	6120
3500						6.9661	3337	.0486	.1017	.4617	6300
3600						6.6542	3119	.0488	.1012	.4691	6480
3700						6.3662	2880	.0487	.1008	.4710	6660
3800						6.0998	2664	.0480	.0998	.4671	6840
3900						5.8537	2461	.0472	.0972	.4598	7020
4000						5.6218	2319	.0460	.0952	.4485	7200
4100						5.4013	2205	.0444	.0924	.4346	7380
4200						5.1873	2140	.0423	.0885	.4176	7560
4300						4.9768	2105	.0408	.0850	.3989	7740
4400						4.7676	2092	.0382	.0799	.3786	7920
4500						4.5591	2085	.0366	.0756	.3577	8100
4600						4.3514	2077	.0338	.0711	.3357	8280
4700						4.1456	2058	.0319	.0660	.3131	8460
4800						3.9437	2019	.0298	.0618	.2916	8640
4900						3.7465	1972	.0276	.0570	.2688	8820
5000						3.5578	1887	.0250	.0517	.2468	9000

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			ρ Residuals, for mole % moisture content					ρ Residuals, for mole % moisture content			
	$\rho \times 10^5$	$-\Delta$	0.1	1.0	5.0	$\rho \times 10^5$	$-\Delta$	0.1	1.0	5.0	
1800	26.630	763	.041	.103	.502	36.041	1039	.059	.147	.716	3240
1850	25.910	720				37.012	1000				3330
1900	25.228	682	.042	.100	.478	36.039	973	.058	.142	.679	3420
1950	24.580	648				35.113	926				3510
2000	23.963	617	.040	.095	.457	34.235	878	.055	.135	.650	3600
2050	23.376	587				33.394	841				3690
2100	22.817	559	.040	.095	.443	32.597	797	.055	.134	.630	3780
2150	22.285	532				31.834	763				3870
2200	21.773	512	.042	.093	.431	31.109	725	.058	.133	.612	3960
2250	21.284	489				30.406	703				4050
2300	20.812	472	.042	.096	.424	29.736	670	.059	.135	.599	4140
2350	20.360	452				29.094	642				4230
2400	19.924	436	.043	.095	.418	28.472	622	.062	.133	.593	4320
2450	19.505	419				27.875	597				4410
2500	19.098	407	.046	.098	.421	27.298	577	.065	.138	.593	4500
2550	18.702	396				26.738	560				4590
2600	18.318	384	.049	.103	.429	26.196	542	.068	.144	.599	4680
2650	17.944	374				25.667	529				4770
2700	17.580	364	.055	.111	.444	25.150	517	.074	.150	.614	4860
2750	17.224	356				24.651	499				4950
2800	16.875	349	.059	.119	.468	24.161	490	.081	.162	.643	5040
2850	16.532	343				23.680	481				5130
2900	16.195	337	.064	.129	.502	23.205	475	.088	.175	.686	5220
2950	15.859	336				22.736	469				5310
3000	15.528	331	.069	.138	.537	22.270	466	.094	.186	.725	5400
3100	14.866	662	.073	.148	.581	21.361	909	.098	.200	.779	5580
3200	14.228	638	.076	.155	.628	20.476	885	.103	.209	.839	5760
3300	13.606	622	.078	.161	.675	19.611	865	.106	.220	.902	5940
3400	13.004	602	.080	.166	.715	18.770	841	.110	.228	.959	6120
3500	12.428	576	.081	.169	.748	17.961	809	.112	.232	1.010	6300
3600	11.882	546	.083	.171	.771	17.187	774	.115	.237	1.049	6480
3700	11.370	512	.082	.171	.784	16.455	732	.114	.237	1.076	6660
3800	10.894	476	.082	.171	.789	15.768	687	.114	.239	1.091	6840
3900	10.451	443	.081	.168	.785	15.127	641	.114	.237	1.095	7020
4000	10.037	414	.080	.166	.776	14.526	601	.112	.234	1.090	7200
4100	9.6465	390	.0778	.1620	.7599	13.962	564	.110	.230	1.076	7380
4200	9.2735	3730	.0752	.1568	.7380	13.426	536	.108	.224	1.052	7560
4300	8.9130	3605	.0727	.1520	.7124	12.913	513	.105	.218	1.023	7740
4400	8.5602	3528	.0696	.1448	.6836	12.416	497	.101	.210	.989	7920
4500	8.2125	3477	.0668	.1382	.6528	11.929	487	.097	.202	.951	8100
4600	7.8678	3447	.0626	.1312	.6193	11.451	478	.092	.193	.908	8280
4700	7.5263	3415	.0595	.1236	.5844	10.978	473	.088	.183	.862	8460
4800	7.1881	3382	.0560	.1160	.5493	10.510	468	.083	.172	.816	8640
4900	6.8552	3329	.0527	.1090	.5126	10.048	462	.079	.163	.767	8820
5000	6.5300	3252	.0481	.0994	.4750	9.5931	455	.0724	.1503	.7161	9000

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	$\rho \times 10^5$	$-\Delta$	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	$\rho \times 10^5$	$-\Delta$	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	
90	781.07										162
100	698.25	8282									180
110	631.86	6639				2653.7					198
120	577.34	5452				2396.5	2572				216
130	531.68	4566				2188.9	2076				234
140	492.81	3887				2017.0	1719				252
150	459.34	3347				1871.5	1455				270
160	430.16	2918				1746.7	1248				288
170	404.52	2564				1638.2	1085				306
180	381.79	2273				1542.8	954				324
190	361.49	2030				1458.2	846				342
200	343.25	1824				1382.7	755				360
210	326.79	1646				1314.8	679				378
220	311.84	1495				1253.5	613				396
230	298.19	1365				1197.7	558				414
240	285.77	1242				1146.8	509				432
250	274.23	1154				1100.0	468				450
260	263.64	1059				1057.0	430				468
270	253.83	981				1017.3	397				486
280	244.75	908				980.43	369				504
290	236.27	848				946.23	3420				522
300	228.37	790	.33	.86	4.22	914.34	3189	1.31	3.39	16.63	540
310	220.99	738				884.54	2980				558
320	214.07	692				856.66	2788				576
330	207.57	650				830.49	2617				594
340	201.45	612				805.88	2461				612
350	195.70	575				782.70	2318				630
360	190.26	544				760.82	2188				648
370	185.09	517				740.15	2067				666
380	180.22	487				720.57	1958				684
390	175.60	462				702.00	1857				702
400	171.19	441	.25	.64	3.18	684.38	1762	1.03	2.55	12.61	720
410	167.02	417				667.62	1676				738
420	163.03	399				651.67	1595				756
430	159.24	379				636.46	1521				774
440	155.63	361				621.96	1450				792
450	152.17	346				608.11	1385				810
460	148.86	331				594.86	1325				828
470	145.70	316				582.18	1268				846
480	142.63	307				570.02	1216				864
490	139.72	291				558.37	1165				882
500	136.94	278	.20	.52.	2.54	547.19	1118	.85	2.07	10.08	900
510	134.25	269				536.44	1075				918
520	131.67	258				526.11	1033				936
530	129.19	248				516.18	993				954
540	126.80	239				506.61	957				972

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	$\rho \times 10^5$	$-\Delta$	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	$\rho \times 10^5$	$-\Delta$	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	
110	4922.1					7561.8					198
120	4373.4	5487				6557.9	10039				216
130	3953.1	4203				5847.7	7102				234
140	3617.4	3357				5305.5	5422				252
150	3339.4	2780				4868.9	4366				270
160	3104.9	2345				4507.9	3610				288
170	2903.4	2015				4202.0	3059				306
180	2728.0	1754				3938.8	2632				324
190	2574.0	1540				3709.0	2298				342
200	2437.0	1370				3506.5	2025				360
210	2314.8	1222				3326.1	1804				378
220	2204.4	1104				9164.6	1615				396
230	2104.5	999				3018.5	1461				414
240	2013.7	908				2886.1	1324				432
250	1930.4	833				2765.1	1210				450
260	1853.9	765				2654.2	1109				468
270	1783.4	705				2552.1	1021				486
280	1718.1	653				2458.0	941				504
290	1657.7	604				2370.7	873				522
300	1601.5	562	2.3	5.9	28.7	2289.4	813	3.3	8.3	40.3	540
310	1548.8	527				2213.9	755				558
320	1499.6	492				2143.2	707				576
330	1453.7	459				2076.9	663				594
340	1410.3	434				2014.7	622				612
350	1369.6	407				1956.2	585				630
360	1331.0	386				1901.0	552				648
370	1294.9	361				1849.1	519				666
380	1260.5	344				1799.7	494				684
390	1227.9	326				1753.0	467				702
400	1197.0	309	1.8	4.5	21.8	1708.9	441	2.6	6.3	30.7	720
410	1167.4	296				1666.7	422				738
420	1139.6	278				1626.8	399				756
430	1113.0	266				1588.7	381				774
440	1087.4	256				1552.3	364				792
450	1063.3	241				1517.4	349				810
460	1040.0	233				1484.3	331				828
470	1017.9	221				1452.7	316				846
480	996.6	213				1422.1	306				864
490	976.2	204				1393.0	291				882
500	956.7	195	1.5	3.6	17.5	1365.1	279	2.1	5.1	24.8	900
510	937.9	188				1338.3	268				918
520	919.8	181				1312.4	259				936
530	902.2	176				1287.6	248				954
540	885.7	165				1263.8	238				972

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	
550	124.50	230				497.39	922				990
560	122.26	224				488.49	890				1008
570	120.10	216				479.92	857				1026
580	118.05	205				471.64	828				1044
590	116.04	201				463.65	799				1062
600	114.11	193	.17	.44	2.12	455.92	773	.68	1.74	8.44	1080
610	112.25	186				448.44	748				1098
620	110.42	183				441.21	723				1116
630	108.69	173				434.20	701				1134
640	106.98	171				427.42	678				1152
650	105.33	165				420.84	658				1170
660	103.75	158				414.46	638				1188
670	102.19	156				408.28	618				1206
680	100.68	151				402.28	600				1224
690	99.23	145				396.45	583				1242
700	97.80	143	.15	.37	1.83	390.78	567	.58	1.44	7.20	1260
710	96.42	138				385.28	550				1278
720	95.09	133				379.93	535				1296
730	93.79	130				374.73	520				1314
740	92.53	126				369.66	507				1332
750	91.30	123				364.74	492				1350
760	90.10	120				359.94	480				1368
770	88.92	118				355.27	467				1386
780	87.79	113				350.72	455				1404
790	86.66	113				346.28	445				1422
800	85.58	108	.13	.33	1.59	341.95	433	.53	1.30	6.32	1440
850	80.56	502				321.85	2010				1530
900	76.07	449	.11	.29	1.42	303.98	1787	.42	1.10	5.62	1620
950	72.073	400				288.00	1598				1710
1000	68.470	3603	.103	.267	1.278	273.61	1439	.40	1.03	5.05	1800
1050	65.211	3259				260.59	1302				1890
1100	62.245	2966	.094	.238	1.155	248.75	1184	.37	.95	4.61	1980
1150	59.540	2705				237.95	1080				2070
1200	57.059	2481	.086	.221	1.064	228.04	991	.34	.87	4.23	2160
1250	54.778	2281				218.93	911				2250
1300	52.671	2107	.079	.201	.985	210.51	842	.32	.79	3.90	2340
1350	50.721	1950				202.72	779				2430
1400	48.910	1811	.076	.189	.913	195.49	723	.29	.75	3.63	2520
1450	47.224	1686				188.75	674				2610
1500	45.651	1573	.071	.182	.857	182.47	628	.28	.71	3.39	2700
1550	44.178	1473				176.58	589				2790
1600	42.798	1380	.074	.161	.804	171.07	551	.26	.65	3.19	2880
1650	41.501	1297				165.89	518				2970
1700	40.279	1222	.062	.156	.757	161.01	488	.24	.61	3.00	3060
1750	39.130	1149				156.41	460				3150

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	$\rho \times 10^5$	$-\Delta$	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	$\rho \times 10^5$	$-\Delta$	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	
550	869.4	163				1240.7	231				990
560	853.8	156				1218.4	223				1008
570	839.0	148				1197.0	214				1026
580	824.4	146				1176.5	205				1044
590	810.4	140				1156.4	201				1062
600	796.8	136	1.2	3.0	14.7	1137.1	193	1.7	4.3	20.9	1080
610	783.8	130				1118.5	186				1098
620	771.3	125				1100.4	181				1116
630	759.0	123				1082.9	175				1134
640	747.12	119				1066.1	168				1152
650	735.63	1149				1049.8	163				1170
660	724.47	1116				1033.7	161				1188
670	713.65	1082				1018.4	153				1206
680	703.16	1049				1003.3	151				1224
690	692.98	1018				988.8	145				1242
700	683.09	989	1.06	2.49	12.51	974.7	141	1.5	3.5	17.8	1260
710	673.46	963				960.9	138				1278
720	664.12	934				947.6	133				1296
730	655.04	908				934.6	130				1314
740	646.19	885				922.0	126				1332
750	637.58	861				909.8	122				1350
760	629.20	838				897.7	121				1368
770	621.02	818				886.2	115				1386
780	613.07	795				874.9	113				1404
790	605.31	776				863.8	111				1422
800	597.76	755	.87	2.26	11.00	853.0	108	1.2	3.2	15.6	1440
850	562.64	3512				802.9	501				1530
900	531.40	3124	.75	1.93	9.77	758.5	444	1.1	2.8	13.9	1620
950	503.48	2792				718.6	399				1710
1000	478.34	2514	.71	1.82	8.83	682.7	359	1.0	2.5	12.5	1800
1050	455.58	2276				650.3	324				1890
1100	434.90	2068	.65	1.66	8.05	620.7	296	.9	2.4	11.5	1980
1150	416.04	1886				593.9	268				2070
1200	398.73	1731	.62	1.52	7.38	569.0	249	.9	2.2	10.5	2160
1250	382.79	1594				546.5	225				2250
1300	368.09	1470	.54	1.35	6.78	525.4	211	.8	1.9	9.7	2340
1350	354.49	1360				506.1	193				2430
1400	341.85	1264	.50	1.30	6.32	488.0	181	.7	1.9	9.0	2520
1450	330.08	1177				471.2	168				2610
1500	319.09	1099	.47	1.21	5.90	455.4	158	.7	1.7	8.4	2700
1550	308.80	1029				439.1	163				2790
1600	299.17	963	.44	1.16	5.55	427.0	121	.6	1.6	7.9	2880
1650	290.11	906				414.0	130				2970
1700	281.58	853	.41	1.04	5.23	401.9	121	.6	1.5	7.5	3060
1750	273.55	803				390.6	113				3150

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure: ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	4.0 Atmospheres Pressure: ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	T (°R)
1800	38.041	1089	.059	.147	.716	152.07	434	.23	.59	2.84	3240
1850	37.012	1029				147.96	411				3330
1900	36.039	973	.058	.142	.679	144.07	389	.23	.57	2.70	3420
1950	35.113	926				140.38	369				3510
2000	34.235	878	.055	.135	.650	136.87	351	.21	.54	2.58	3600
2050	33.394	841				133.52	335				3690
2100	32.597	797	.055	.134	.630	130.33	319	.22	.53	2.49	3780
2150	31.834	763				127.30	303				3870
2200	31.109	725	.058	.133	.612	124.41	289	.22	.52	2.40	3960
2250	30.406	703				121.63	278				4050
2300	29.736	670	.059	.135	.599	118.96	267	.21	.50	2.32	4140
2350	29.094	642				116.41	255				4230
2400	28.472	622	.062	.133	.593	113.96	245	.22	.50	2.28	4320
2450	27.875	597				111.60	236				4410
2500	27.298	577	.065	.138	.593	109.33	227	.22	.51	2.25	4500
2550	26.738	560				107.14	219				4590
2600	26.196	542	.068	.144	.599	105.02	212	.24	.52	2.24	4680
2650	25.667	529				102.96	206				4770
2700	25.150	517	.074	.150	.614	100.98	198	.26	.53	2.25	4860
2750	24.651	499				99.049	193				4950
2800	24.161	490	.081	.162	.643	97.185	1864	.266	.563	2.294	5040
2850	23.680	481				95.356	1829				5130
2900	23.205	475	.088	.175	.686	93.575	1781	.288	.589	2.362	5220
2950	22.736	469				91.833	1742				5310
3000	22.270	466	.094	.186	.725	90.125	1708	.312	.618	2.428	5400
3100	21.361	909	.098	.200	.779	86.784	3341	.320	.648	2.532	5580
3200	20.476	885	.103	.209	.839	83.583	3201	.340	.688	2.662	5760
3300	19.611	865	.106	.220	.902	80.469	3114	.352	.721	2.816	5940
3400	18.770	841	.110	.228	.959	77.441	3028	.368	.754	2.984	6120
3500	17.961	809	.112	.232	1.010	74.493	2948	.383	.783	3.163	6300
3600	17.187	774	.115	.237	1.049	71.618	2875	.386	.804	3.328	6480
3700	16.455	732	.114	.237	1.076	68.830	2788	.395	.819	3.489	6660
3800	15.768	687	.114	.239	1.091	66.146	2684	.398	.838	3.631	6840
3900	15.127	641	.114	.237	1.095	63.569	2577	.404	.843	3.738	7020
4000	14.526	601	.112	.234	1.090	61.113	2456	.403	.849	3.826	7200
4100	13.962	564	.110	.230	1.076	58.790	2323	.409	.855	3.881	7380
4200	13.426	536	.108	.224	1.052	56.580	2210	.408	.849	3.904	7560
4300	12.913	513	.105	.218	1.023	54.495	2085	.405	.846	3.902	7740
4400	12.416	497	.101	.210	.989	52.513	1982	.404	.835	3.873	7920
4500	11.929	487	.097	.202	.951	50.621	1892	.391	.821	3.820	8100
4600	11.451	478	.092	.193	.908	48.805	1816	.386	.801	3.742	8280
4700	10.978	473	.088	.183	.862	47.051	1754	.373	.782	3.648	8460
4800	10.510	468	.083	.172	.816	45.348	1703	.365	.755	3.538	8640
4900	10.048	462	.079	.163	.767	43.679	1669	.348	.726	3.413	8820
5000	9.5931	455	.0724	.1503	.7161	42.043	1636	.331	.697	3.280	9000

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	265.95	760	.39	1.03	4.94	379.6	110	.6	1.5	7.1	3240
1850	258.78	717				369.6	100				3330
1900	251.98	680	.39	.97	4.70	359.8	98	.6	1.4	6.7	3420
1950	245.53	645				350.5	93				3510
2000	239.38	615	.37	.94	4.49	341.7	88	.5	1.4	6.4	3600
2050	233.56	582				333.4	83				3690
2100	227.99	557	.38	.92	4.32	325.4	80	.5	1.3	6.1	3780
2150	222.70	529				317.9	75				3870
2200	217.63	507	.37	.88	4.15	310.9	70	.5	1.2	5.9	3960
2250	212.76	487				303.8	71				4050
2300	208.12	464	.35	.84	4.01	297.3	65	.5	1.2	5.7	4140
2350	203.65	447				290.8	65				4230
2400	199.39	426	.37	.84	3.94	284.8	60	.5	1.2	5.6	4320
2450	195.27	412				279.0	58				4410
2500	191.31	396	.37	.86	3.87	273.2	58	.5	1.2	5.5	4500
2550	187.52	379				267.7	55				4590
2600	183.83	369	.39	.88	3.83	262.7	50	.6	1.2	5.4	4680
2650	180.27	356				257.4	53				4770
2700	176.83	344	.42	.90	3.83	252.7	47	.6	1.2	5.4	4860
2750	173.50	333				247.9	48				4950
2800	170.26	324	.43	.94	3.88	243.4	45	.6	1.3	5.4	5040
2850	167.10	316				238.9	45				5130
2900	164.04	306	.46	.97	3.93	234.6	43	.6	1.3	5.5	5220
2950	161.05	299				230.3	43				5310
3000	158.12	293	.51	1.02	4.03	226.1	42	.7	1.4	5.6	5400
3100	152.44	568	.52	1.05	4.16	218.15	79	.71	1.44	5.73	5580
3200	147.01	543	.55	1.12	4.32	210.53	762	.75	1.52	5.92	5760
3300	141.75	526	.57	1.16	4.52	203.17	736	.79	1.58	6.16	5940
3400	136.67	508	.59	1.22	4.76	196.08	709	.81	1.65	6.45	6120
3500	131.72	495	.62	1.27	5.02	189.18	690	.85	1.72	6.76	6300
3600	126.88	484	.62	1.30	5.27	182.45	673	.84	1.75	7.06	6480
3700	122.19	469	.64	1.33	5.53	175.93	652	.87	1.82	7.42	6660
3800	117.64	455	.65	1.36	5.78	169.58	635	.89	1.86	7.76	6840
3900	113.24	440	.67	1.38	5.99	163.43	615	.91	1.87	8.06	7020
4000	109.01	423	.67	1.39	6.18	157.49	594	.92	1.91	8.34	7200
4100	104.97	404	.68	1.41	6.32	151.79	570	.93	1.94	8.57	7380
4200	101.11	386	.68	1.42	6.43	146.31	548	.94	1.95	8.76	7560
4300	97.444	367	.679	1.417	6.490	141.09	522	.94	1.96	8.89	7740
4400	93.959	3485	.679	1.416	6.501	136.11	498	.94	1.96	8.96	7920
4500	90.637	3322	.669	1.403	6.477	131.35	476	.93	1.95	8.98	8100
4600	87.459	3178	.664	1.378	6.413	126.80	455	.93	1.93	8.95	8280
4700	84.413	3046	.649	1.359	6.317	122.45	435	.91	1.91	8.87	8460
4800	81.478	2935	.638	1.327	6.188	118.27	418	.90	1.88	8.75	8640
4900	78.623	2855	.613	1.284	6.027	114.23	404	.87	1.83	8.58	8820
5000	75.848	2775	.596	1.253	5.857	110.31	392	.85	1.80	8.38	9000

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
	$\rho \times 10^5$	$-\Delta$	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	$\rho \times 10^5$	$-\Delta$	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	
110	7561.8										198
120	6557.9	10039									216
130	5847.7	7102									234
140	5305.5	5422									252
150	4868.9	4366				26750.					270
160	4507.9	3610				22270.	4480				288
170	4202.0	3059				19610.	2660				306
180	3938.8	2632				17721.	1889				324
190	3709.0	2298				16263.	1458				342
200	3506.5	2025				15086.	1177				360
210	3326.1	1804				14105.	981				378
220	3164.6	1615				13267.	838				396
230	3018.5	1461				12542.	725				414
240	2886.1	1324				11903.	639				432
250	2765.1	1210				11336.	567				450
260	2654.2	1109				10826.	510				468
270	2552.1	1021				10365.	461				486
280	2458.0	941				9946.	419				504
290	2370.7	873				9564.	382				522
300	2289.4	813	3.3	8.3	40.3	9213.	351				540
310	2213.9	755				8887.	326				558
320	2143.2	707				8586.	301				576
330	2076.9	663				8307.	279				594
340	2014.7	622				8046.	261				612
350	1956.2	585				7802.1	244				630
360	1901.0	552				7573.6	2285				648
370	1849.1	519				7358.8	2148				666
380	1799.7	494				7156.3	2025				684
390	1753.0	467				6965.7	1906				702
400	1708.9	441	2.6	6.3	30.7	6785.0	1807				720
410	1666.7	422				6613.9	1711				738
420	1626.8	399				6451.8	1621				756
430	1588.7	381				6297.8	1540				774
440	1552.3	364				6151.0	1468				792
450	1517.4	349				6011.2	1398				810
460	1484.3	331				5878.0	1332				828
470	1452.7	316				5750.8	1272				846
480	1422.1	306				5628.9	1219				864
490	1393.0	291				5512.5	1164				882
500	1365.1	279	2.1	5.1	24.8	5400.8	1117	7.1	17.9	89.3	900
510	1338.3	268				5293.7	1071				918
520	1312.4	259				5190.8	1029				936
530	1287.6	248				5092.0	988				954
540	1263.8	238				4997.1	944				972

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
	ρ x10^5	-Δ	ρ Residuals, for mole moisture content 0.1	1.0	5.0	ρ x10^5	-Δ	ρ Residuals, for mole moisture content 0.1	1.0	5.0	
180	35280.					54770.					324
190	31204.	4080				47420.	7350				342
200	28266.	2938				42251.	5170				360
210	25995.	2271				38400.	3851				378
220	24161.	1834				35374.	3026				396
230	22628.	1533				32913.	2461				414
240	21324.	1304				30853.	2060				432
250	20192.	1132				29092.	1761				450
260	19196.	996				27564.	1528				468
270	18310.	886				26221.	1343				486
280	17515.	795				25024.	1197				504
290	16798.	717				23953.	1071				522
300	16143.	655				22985.	968				540
310	15546.	597				22102.	883				558
320	14996.	550				21296.	806				576
330	14487.	509				20553.	743				594
340	14015.	472				19866.	687				612
350	13576.	439				19231.	635				630
360	13167.	409				18639.	592				648
370	12783.	384				18087.	552				666
380	12424.	359				17570.	517				684
390	12086.	338				17084.	486				702
400	11765.	321				16627.	457				720
410	11463.	302				16195.	432				738
420	11177.	286				15789.	406				756
430	10906.	271				15403.	386				774
440	10651.	255				15036.	367				792
450	10405.	246				14690.	346				810
460	10174.	231				14359.	331				828
470	9951.	223				14043.	316				846
480	9737.	214				13742.	301				864
490	9537.	200				13456.	286				882
500	9341.	196				13180.	276				900
510	9155.	186				12919.	261				918
520	8977.	178				12665.	254				936
530	8804.	173				12424.	241				954
540	8641.	163				12191.	233				972

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	
550	1240.7	231				4905.5	921				990
560	1218.4	223				4817.5	880				1008
570	1197.0	214				4732.7	848				1026
580	1176.5	205				4650.9	818				1044
590	1156.4	201				4571.8	791				1062
600	1137.	193	1.7	4.3	20.9	4495.3	765	6.0	15.9	76.4	1080
610	1118.5	186				4421.6	737				1098
620	1100.4	181				4350.3	713				1116
630	1082.9	175				4281.1	692				1134
640	1066.1	168				4214.3	668				1152
650	1049.8	163				4149.6	647				1170
660	1033.7	161				4086.9	627				1188
670	1018.4	153				4025.9	610				1206
680	1003.3	151				3966.7	592				1224
690	988.8	145				3909.5	572				1242
700	974.7	141	1.5	3.5	17.8	3853.8	557	5.7	13.7	66.4	1260
710	960.9	138				3799.6	542				1278
720	947.6	133				3747.1	525				1296
730	934.6	130				3696.0	511				1314
740	922.0	126				3646.3	497				1332
750	909.8	122				3597.9	484				1350
760	897.7	121				3550.9	470				1368
770	886.2	115				3505.0	459				1386
780	874.9	113				3460.1	449				1404
790	863.8	111				3416.7	434				1422
800	853.0	108	1.2	3.2	15.6	3374.3	424	4.2	12.0	58.4	1440
850	802.9	501				3177.1	1972				1530
900	758.5	444	1.1	2.8	13.9	3001.7	1754	4.1	10.9	53.0	1620
950	718.6	399				2844.9	1568				1710
1000	682.7	359	1.0	2.5	12.5	2703.9	1410	3.9	9.7	48.0	1800
1050	650.3	324				2576.2	1277				1890
1100	620.7	296	.9	2.4	11.5	2460.0	1162	3.8	8.9	43.7	1980
1150	593.9	268				2353.9	1061				2070
1200	569.0	249	.9	2.2	10.5	2256.6	973	3.3	8.2	40.1	2160
1250	546.5	225				2167.2	894				2250
1300	525.4	211	.8	1.9	9.7	2084.5	827	3.1	7.7	37.3	2340
1350	506.1	193				2007.9	766				2430
1400	488.0	181	.7	1.9	9.0	1936.9	710	2.7	7.1	34.6	2520
1450	471.2	168				1870.7	662				2610
1500	455.4	158	.7	1.7	8.4	1808.7	620	2.6	6.5	32.5	2700
1550	439.1	163				1751.0	577				2790
1600	427.0	121	.6	1.6	7.9	1696.6	544	2.7	6.3	30.7	2880
1650	414.0	130				1645.4	512				2970
1700	401.9	121	.6	1.5	7.5	1597.5	479	2.2	5.7	28.8	3060
1750	390.6	113				1552.3	452				3150

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure		ρ Residuals, for mole % moisture content			100.0 Atmospheres Pressure		ρ Residuals, for mole % moisture content			T (°R)
	ρ x10^5	-Δ	0.1	1.0	5.0	ρ x10^5	-Δ	0.1	1.0	5.0	
550	8483.	158				11968.	223				990
560	8330.	153				11752.	216				1008
570	8182.	148				11546.	206				1026
580	8041.	141				11346.	200				1044
590	7903.	138				11152.	194				1062
600	7772.0	131				10967.	185				1080
610	7644.6	1274				10789.	178				1098
620	7521.6	1230				10615.	174				1116
630	7402.5	1191				10447.	168				1134
640	7287.1	1154				10284.	163				1152
650	7175.4	1117				10126.	158				1170
660	7067.0	1084				9976.	150				1188
670	6962.1	1049				9828.	148				1206
680	6860.5	1016				9685.	143				1224
690	6761.7	988				9547.	138				1242
700	6665.6	961				9411.	136				1260
710	6572.5	931				9281.	130				1278
720	6481.7	908				9153.	128				1296
730	6393.6	881				9027.	126				1314
740	6308.1	855				8907.	120				1332
750	6224.5	836				8791.	116				1350
760	6143.5	810				8676.	115				1368
770	6064.4	791				8566.	110				1386
780	5987.4	770				8458.	108				1404
790	5912.4	750				8352.	106				1422
800	5839.4	730	7.3	19.9	96.4	8249.2	103				1440
850	5499.9	3395				7772.5	4767				1530
900	5198.6	3013	6.8	18.1	87.7	7348.8	4237				1620
950	4928.4	2702				6969.7	3791				1710
1000	4685.5	2429	6.7	16.4	79.6	6628.4	3413				1800
1050	4465.5	2200				6319.3	3091				1890
1100	4265.5	2000	6.1	15.0	73.0	6038.1	2812	7.8	20.1	99.3	1980
1150	4082.8	1827				5781.2	2569				2070
1200	3915.2	1676	5.6	13.6	67.0	5545.6	2356	7.3	18.4	90.8	2160
1250	3760.9	1543				5328.3	2173				2250
1300	3618.4	1425	5.1	13.0	62.4	5127.8	2005	6.7	17.6	85.2	2340
1350	3486.2	1322				4941.7	1861				2430
1400	3363.5	1227	4.7	12.2	58.2	4768.8	1729	6.4	16.7	79.8	2520
1450	3249.4	1141				4607.7	1611				2610
1500	3142.5	1069	4.4	10.9	54.8	4457.4	1503	6.1	15.2	75.5	2700
1550	3042.6	999				4316.2	1412				2790
1600	2948.8	938	4.8	10.6	51.7	4183.7	1325	6.7	14.9	71.6	2880
1650	2860.5	883				4059.3	1244				2970
1700	2777.4	831	3.8	9.7	48.5	3942.1	1172	5.1	13.5	66.6	3060
1750	2699.1	783				3831.7	1104				3150

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure		ρ Residuals, for mole % moisture content			40.0 Atmospheres Pressure		ρ Residuals, for mole % moisture content			T (°R)
	ρ x10^5	-Δ	0.1	1.0	5.0	ρ x10^5	-Δ	0.1	1.0	5.0	
1800	379.6	110	.6	1.5	7.1	1509.4	429	2.1	5.5	27.2	3240
1850	369.6	100				1469.0	404				3330
1900	359.8	98	.6	1.4	6.7	1430.6	384	2.2	5.3	26.1	3420
1950	350.5	93				1394.2	364				3510
2000	341.7	88	.5	1.4	6.4	1359.6	346	2.1	5.1	24.8	3600
2050	333.4	83				1326.5	331				3690
2100	325.4	80	.5	1.3	6.1	1295.1	314	1.8	4.9	23.7	3780
2150	317.9	75				1265.3	298				3870
2200	310.9	70	.5	1.2	5.9	1236.7	286	1.9	4.7	22.9	3960
2250	303.8	71				1209.3	274				4050
2300	297.3	65	.5	1.2	5.7	1183.2	261	1.8	4.6	22.1	4140
2350	290.8	65				1158.1	251				4230
2400	284.8	60	.5	1.2	5.6	1134.1	240	1.8	4.4	21.4	4320
2450	279.0	58				1111.0	231				4410
2500	273.2	58	.5	1.2	5.5	1088.6	224	1.9	4.5	20.9	4500
2550	267.7	55				1067.3	213				4590
2600	262.7	50	.6	1.2	5.4	1046.7	206	1.9	4.4	20.5	4680
2650	257.4	53				1026.9	198				4770
2700	252.7	47	.6	1.2	5.4	1007.9	190	2.0	4.5	20.2	4860
2750	247.9	48				989.5	184				4950
2800	243.4	45	.6	1.3	5.4	971.5	180	2.1	4.6	20.1	5040
2850	238.9	45				954.2	173				5130
2900	234.6	43	.6	1.3	5.5	937.4	168	2.1	4.6	20.0	5220
2950	230.3	43				920.8	166				5310
3000	226.1	42	.7	1.4	5.6	905.0	158	2.3	4.9	20.1	5400
3100	218.15	79	.71	1.44	5.73	873.88	311	2.40	4.93	20.28	5580
3200	210.53	762	.75	1.52	5.92	844.98	2890	2.43	5.07	20.56	5760
3300	203.17	736	.79	1.58	6.16	817.41	2757	2.57	5.26	21.02	5940
3400	196.08	709	.81	1.65	6.45	791.09	2632	2.70	5.46	21.60	6120
3500	189.18	690	.85	1.72	6.76	765.75	2534	2.79	5.66	22.19	6300
3600	182.45	673	.84	1.75	7.06	741.27	2448	2.77	5.72	22.76	6480
3700	175.93	652	.87	1.82	7.42	717.73	2354	2.89	6.00	23.59	6660
3800	169.58	635	.89	1.86	7.76	694.88	2285	2.95	6.11	24.42	6840
3900	163.43	615	.91	1.87	8.06	672.75	2213	3.04	6.25	25.32	7020
4000	157.49	594	.92	1.91	8.34	651.20	2155	3.09	6.32	26.17	7200
4100	151.79	570	.93	1.94	8.57	630.27	2093	3.13	6.44	27.01	7380
4200	146.31	548	.94	1.95	8.76	609.93	2034	3.17	6.53	27.92	7560
4300	141.09	522	.94	1.96	8.89	590.16	1977	3.19	6.68	28.71	7740
4400	136.11	498	.94	1.96	8.96	570.99	1917	3.16	6.73	29.39	7920
4500	131.35	476	.93	1.95	8.98	552.50	1849	3.28	6.81	30.08	8100
4600	126.80	455	.93	1.93	8.95	534.61	1789	3.26	6.84	30.61	8280
4700	122.45	435	.91	1.91	8.87	517.40	1721	3.26	6.85	30.98	8460
4800	118.27	418	.90	1.88	8.75	500.87	1653	3.25	6.84	31.26	8640
4900	114.23	404	.87	1.83	8.58	484.96	1591	3.26	6.80	31.33	8820
5000	110.31	392	.85	1.80	8.38	469.53	1543	3.21	6.76	31.27	9000

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	ρ x10^5	-Δ	ρ Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2625.1	740	3.3	9.1	45.9	3727.6	1041	5.0	12.6	63.6	3240
1850	2555.4	697				3628.7	989				3330
1900	2489.1	663	3.7	8.9	44.2	3534.9	938	5.2	12.1	61.1	3420
1950	2425.9	632				3445.8	891				3510
2000	2366.0	599	3.6	8.7	42.1	3361.5	843	4.9	12.0	58.6	3600
2050	2309.0	570				3280.7	808				3690
2100	2254.6	544	3.1	8.3	40.2	3204.0	767	4.4	11.6	55.9	3780
2150	2202.6	520				3130.7	733				3870
2200	2153.2	494	3.2	7.9	38.8	3060.7	700	4.5	11.1	54.0	3960
2250	2105.8	474				2993.5	672				4050
2300	2060.6	452	3.1	8.1	37.6	2929.5	640	4.5	11.6	52.5	4140
2350	2017.0	436				2867.8	617				4230
2400	1975.3	417	3.1	7.6	36.3	2808.8	590	4.3	10.6	50.5	4320
2450	1935.4	399				2752.3	565				4410
2500	1896.8	386	3.3	7.6	35.4	2697.9	544	4.7	10.4	49.2	4500
2550	1859.9	369				2645.5	524				4590
2600	1824.3	356	3.2	7.4	34.7	2595.0	505	4.5	10.3	48.3	4680
2650	1790.2	341				2546.6	484				4770
2700	1757.0	332	3.3	7.6	34.2	2499.7	469	4.6	10.4	47.3	4860
2750	1724.9	321				2454.8	449				4950
2800	1694.1	308	3.5	7.6	33.7	2411.1	437	4.9	10.5	46.6	5040
2850	1664.2	299				2368.7	424				5130
2900	1635.1	291	3.4	7.6	33.8	2327.6	411	4.7	10.5	46.9	5220
2950	1606.7	284				2287.7	399				5310
3000	1579.4	273	3.6	7.9	33.5	2249.0	387	4.9	10.8	46.1	5400
3100	1524.7	547	3.9	8.1	33.7	2170.2	788	5.2	11.1	46.2	5580
3200	1475.2	495	3.9	8.2	33.9	2100.5	697	5.1	11.1	46.3	5760
3300	1428.2	470	4.1	8.6	34.5	2034.6	659	5.5	11.7	47.1	5940
3400	1383.3	449	4.4	8.9	35.2	1971.6	630	6.0	12.1	47.9	6120
3500	1340.3	430	4.6	9.1	36.0	1911.4	602	6.1	12.3	48.9	6300
3600	1298.9	414	4.6	9.3	36.8	1853.5	579	6.3	12.7	50.0	6480
3700	1259.1	398	4.7	9.7	37.9	1797.7	558	6.4	13.1	51.4	6660
3800	1220.6	385	4.8	9.9	39.2	1744.0	537	6.5	13.5	53.1	6840
3900	1183.4	372	5.0	10.4	40.5	1692.0	520	6.8	14.3	54.7	7020
4000	1147.2	362	5.0	10.3	41.7	1641.5	505	6.7	14.0	56.2	7200
4100	1112.1	351	5.1	10.4	42.9	1592.9	486	6.9	14.2	57.8	7380
4200	1078.1	340	5.1	10.6	44.3	1545.7	472	7.0	14.5	59.5	7560
4300	1045.0	331	5.2	10.9	45.5	1500.0	457	7.1	14.8	61.1	7740
4400	1012.8	322	5.2	11.0	46.7	1455.5	445	7.1	15.0	62.7	7920
4500	981.64	312	5.35	11.09	48.01	1412.3	432	7.3	15.1	64.5	8100
4600	951.33	3031	5.35	11.18	49.03	1370.4	419	7.4	15.2	65.3	8280
4700	921.98	2935	5.33	11.16	49.81	1329.5	409	7.2	15.2	66.9	8460
4800	893.68	2830	5.33	11.20	50.54	1290.0	395	7.3	15.2	68.0	8640
4900	866.33	2735	5.37	11.22	51.02	1251.7	383	7.3	15.3	68.9	8820
5000	839.76	2657	5.33	11.24	51.36	1214.4	373	7.2	15.3	69.6	9000

Table 1510.03 DENSITY (ρ in slugs/ft^3) for dry and moist air (Concluded)
(See Section 1500.3 for definition of residuals)

Table 1510.04

0.01 Atmosphere Pressure							
T (°K)	$H_T-U_o^o$ x10^{-4}	Δ	T (°R)	T (°K)	$H_T-U_o^o$ x10^{-4}	Δ	T (°R)
50	53.56		90	300	323.42	1081	540
60	64.35	1079	108	310	334.24	1082	558
70	75.16	1081	126	320	345.06	1082	576
80	85.96	1080	144	330	355.89	1083	594
90	96.75	1079	162	340	366.73	1084	612
100	107.54	1079	180	350	377.58	1085	630
110	118.33	1079	198	360	388.43	1085	648
120	129.12	1079	216	370	399.30	1087	666
130	139.91	1079	234	380	410.18	1088	684
140	150.69	1078	252	390	421.07	1089	702
150	161.48	1079	270	400	431.96	1089	720
160	172.27	1079	288	410	442.88	1092	738
170	183.06	1079	306	420	453.81	1093	756
180	193.84	1078	324	430	464.75	1094	774
190	204.63	1079	342	440	475.71	1096	792
200	215.42	1079	360	450	486.69	1098	810
210	226.22	1080	378	460	497.68	1099	828
220	237.01	1079	396	470	508.70	1102	846
230	247.81	1080	414	480	519.73	1103	864
240	258.60	1079	432	490	530.78	1105	882
250	269.40	1080	450	500	541.85	1107	900
260	280.19	1079	468	510	552.94	1109	918
270	290.99	1080	486	520	564.05	1111	936
280	301.80	1081	504	530	575.19	1114	954
290	312.61	1081	522	540	586.35	1116	972

Moisture residuals at 300°K(540°R)

Mole % moisture content	0.5	1.0	5.0
$H_T-U_o^o$ Residuals	-43.7	-87.4	-444.0

Conversion Factors for Enthalpy ($H_T-U_o^o$ or H_T)			
To Convert Tabulated Value of	To	Having Dimension Indicated below	Multiply by
$(H_T-U_o^o)$ x10^{-4} H_T x 10^{-4} with dimensions of ft lb_F $slug^{-1}$	$(H_T-U_o^o)$ x10^{-4} H_T x10^{-4}	ft^2 sec^{-2}	1.000000
		ft lb_F lb_M^{-1}	0.0310810
		ft lb_F $mole_{lb}^{-1}$	0.900293
		Btu lb^{-1}	3.99680 x10^{-5}
		Btu $mole_{lb}^{-1}$	0.0115771

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air
(See Section 1500.3 for definition of residuals)

0.01 Atmosphere Pressure							
T (°K)	$H_T-U_o^o$ $x10^{-4}$	Δ	T (°R)	T (°K)	$H_T-U_o^o$ $x10^{-4}$	Δ	T (°R)
550	597.52	1117	990	800	885.17	1181	1440
560	608.73	1121	1008	850	944.6	594	1530
570	619.96	1123	1026	900	1004.7	601	1620
580	631.21	1125	1044	950	1065.3	606	1710
590	642.48	1127	1062	1000	1126.5	612	1800
600	653.78	1130	1080	1050	1188.2	617	1890
610	665.11	1133	1098	1100	1250.5	623	1980
620	676.46	1135	1116	1150	1313.3	628	2070
630	687.84	1138	1134	1200	1376.5	632	2160
640	699.24	1140	1152	1250	1440.2	637	2250
650	710.67	1143	1170	1300	1504.5	643	2340
660	722.12	1145	1188	1350	1569.1	646	2430
670	733.60	1148	1206	1400	1634.3	652	2520
680	745.10	1150	1224	1450	1699.9	656	2610
690	756.63	1153	1242	1500	1766.1	662	2700
700	768.19	1156	1260	1550	1832.9	668	2790
710	779.77	1158	1278	1600	1900.2	673	2880
720	791.37	1160	1296	1650	1968.2	680	2970
730	803.01	1164	1314	1700	2037.0	688	3060
740	814.67	1166	1332	1750	2106.7	697	3150
750	826.36	1169	1350	1800	2177.6	709	3240
760	838.07	1171	1368	1850	2250.0	724	3330
770	849.81	1174	1386	1900	2324.4	744	3420
780	861.57	1176	1404	1950	2401.3	769	3510
790	873.36	1179	1422	2000	2481.5	802	3600
				2050	2566.3	848	3690
				2100	2657.2	909	3780
				2150	2755.5	983	3870
				2200	2862.2	1067	3960
				2250	2978.5	1163	4050
				2300	3105.5	1270	4140

Conversion Factors for Enthalpy ($H_T-U_o^o$ or H_T)			
To Convert Tabulated Value of	To	Having Dimension Indicated below	Multiply by
$(H_T-U_o^o)$ $x10^{-4}$	$(H_T-U_o^o)$ $x10^{-4}$	cal gm^{-1}	2.22044×10^{-5}
H_T $x10^{-4}$	H_T $x10^{-4}$	cal $mole_{gm}^{-1}$	6.43174×10^{-4}
with dimensions of ft lb_F $slug^{-1}$		joule gm^{-1}	9.29034×10^{-5}
		erg gm^{-1}	929.034

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
80	85.75										144
90	96.58	1083				96.01					162
100	107.40	1082				106.91	1090				180
110	118.21	1081				117.80	1089				198
120	129.01	1080				128.65	1085				216
130	139.81	1080				139.51	1086				234
140	150.61	1080				150.34	1083				252
150	161.40	1079				161.16	1082				270
160	172.20	1080				171.98	1082				288
170	183.00	1080				182.80	1082				306
180	193.79	1079				193.61	1081				324
190	204.58	1079				204.42	1081				342
200	215.38	1080				215.23	1081				360
210	226.17	1079				226.03	1080				378
220	236.97	1080				236.84	1081				396
230	247.76	1079				247.64	1080				414
240	258.57	1081				258.45	1081				432
250	269.36	1079				269.26	1081				450
260	280.16	1080				280.06	1080				468
270	290.96	1080				290.87	1081				486
280	301.77	1081				301.69	1082				504
290	312.58	1081				312.51	1082				522
300	323.39	1081	-43.7	-87.4	-443.9	323.32	1081	-43.7	-87.4	-444.0	540
310	334.21	1082				334.14	1082				558
320	345.04	1083				344.97	1083				576
330	355.88	1084				355.81	1084				594
340	366.71	1083				366.65	1084				612
350	377.56	1085				377.51	1086				630
360	388.41	1085				388.36	1085				648
370	399.28	1087				399.24	1088				666
380	410.16	1088				410.12	1088				684
390	421.05	1089				421.01	1089				702
400	431.94	1089	-43.4	-86.9	-441.0	431.91	1090	-43.4	-86.8	-440.9	720
410	442.87	1093				442.83	1092				738
420	453.80	1093				453.77	1094				756
430	464.74	1094				464.71	1094				774
440	475.70	1096				475.68	1097				792
450	486.68	1098				486.66	1098				810
460	497.67	1099				497.65	1099				828
470	508.69	1102				508.66	1101				846
480	519.72	1103				519.69	1103				864
490	530.77	1105				530.76	1107				882
500	541.84	1107	-43.1	-86.2	-437.8	541.82	1106	-43.1	-86.2	-437.9	900
510	552.94	1110				552.93	1111				918
520	564.05	1111				564.03	1110				936
530	575.19	1114				575.17	1114				954
540	586.35	1116				586.33	1116				972

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
90	95.43					94.83					162
100	106.43	1100				105.94	1111				180
110	117.39	1096				116.97	1103				198
120	128.30	1091				127.91	1094				216
130	139.20	1090				138.88	1097				234
140	150.07	1087				149.77	1089				252
150	160.91	1084				160.66	1089				270
160	171.76	1085				171.54	1088				288
170	182.60	1084				182.40	1086				306
180	193.43	1083				193.24	1084				324
190	204.25	1082				204.08	1084				342
200	215.07	1082				214.92	1084				360
210	225.89	1082				225.75	1083				378
220	236.71	1082				236.57	1082				396
230	247.52	1081				247.40	1083				414
240	258.34	1082				258.23	1083				432
250	269.15	1081				269.13	1090				450
260	279.96	1081				279.87	1074				468
270	290.78	1082				290.69	1082				486
280	301.60	1082				301.52	1083				504
290	312.42	1082				312.35	1083				522
300	323.25	1083	-43.6	-87.4	-444.0	323.1[illegible]	1082	-43.7	-87.5	-444.1	540
310	334.08	1083				334.01	1084				558
320	344.91	1083				344.85	1084				576
330	355.75	1084				355.69	1084				594
340	366.60	1085				366.55	1086				612
350	377.46	1086				377.40	1085				630
360	388.32	1086				388.27	1087				648
370	399.19	1087				399.16	1089				666
380	410.08	1089				410.03	1087				684
390	420.97	1089				420.93	1090				702
400	431.88	1091	-43.4	-86.8	-441.0	431.83	1090	-43.4	-86.9	-441.0	720
410	442.80	1092				442.76	1093				738
420	453.74	1094				453.70	1094				756
430	464.68	1094				464.65	1095				774
440	475.65	1097				475.62	1097				792
450	486.63	1098				486.61	1099				810
460	497.62	1099				497.60	1099				828
470	508.64	1102				508.62	1102				846
480	519.67	1103				519.64	1102				864
490	530.73	1106				530.71	1107				882
500	541.80	1107	-43.1	-86.2	-437.9	541.79	1108	-43.1	-86.2	-437.9	900
510	552.90	1110				552.89	1110				918
520	564.03	1113				564.01	1112				936
530	575.17	1114				575.15	1114				954
540	586.32	1115				586.31	1116				972

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Press re					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
550	597.52	1117				597.51	1118				990
560	608.73	1121				608.72	1121				1008
570	619.96	1123				619.95	1123				1026
580	631.21	1125				631.20	1125				1044
590	642.48	1127				642.47	1127				1062
600	653.78	1130	-42.9	-85.7	-434.7	653.77	1130	-42.9	-85.6	-434.8	1080
610	665.11	1133				665.11	1134				1098
620	676.46	1135				676.45	1134				1116
630	687.84	1138				687.84	1139				1134
640	699.24	1140				699.24	1140				1152
650	710.67	1143				710.67	1143				1170
660	722.12	1145				722.12	1145				1188
670	733.60	1148				733.60	1148				1206
680	745.10	1150				745.10	1150				1224
690	756.63	1153				756.63	1153				1242
700	768.19	1156	-42.5	-85.1	-431.3	768.20	1157	-42.4	-84.9	-431.2	1260
710	779.77	1158				779.78	1158				1278
720	791.37	1160				791.38	1160				1296
730	803.01	1164				803.02	1164				1314
740	814.67	1166				814.67	1165				1332
750	826.36	1169				826.37	1170				1350
760	838.07	1171				838.08	1171				1368
770	849.81	1174				849.82	1174				1386
780	861.57	1176				861.58	1176				1404
790	873.36	1179				873.37	1179				1422
800	885.17	1181	-42.1	-84.3	-427.9	885.19	1182	-42.2	-84.2	-427.8	1440
850	944.6	594				944.6	594				1530
900	1004.7	601	-41.8	-83.5	-424.1	1004.7	601	-41.7	-83.4	-424.0	1620
950	1065.3	606				1065.3	606				1710
1000	1126.5	612	-41.5	-82.7	-420.3	1126.5	612	-41.4	-82.6	-420.1	1800
1050	1188.2	617				1188.2	617				1890
1100	1250.5	623	-41.1	-82.0	-416.3	1250.5	623	-41.0	-82.0	-416.3	1980
1150	1313.3	628				1313.3	628				2070
1200	1376.5	632	-40.8	-81.0	-412.2	1376.5	632	-40.6	-81.0	-412.0	2160
1250	1440.2	637				1440.2	637				2250
1300	1504.5	643	-40.1	-80.2	-407.4	1504.5	643	-40.2	-80.2	-407.6	2340
1350	1569.1	646				1569.1	646				2430
1400	1634.2	651	-39.6	-79.3	-402.9	1634.2	651	-39.7	-79.3	-402.9	2520
1450	1699.8	656				1699.8	656				2610
1500	1765.8	660	-39.1	-78.1	-397.9	1765.8	660	-39.2	-78.2	-397.9	2700
1550	1832.3	665				1832.3	665				2790
1600	1899.3	670	-38.8	-76.9	-392.3	1899.3	670	-38.4	-77.1	-392.6	2880
1650	1966.9	676				1966.8	675				2970
1700	2035.1	682	-37.6	-75.4	-386.0	2034.8	680	-37.7	-75.6	-386.6	3060
1750	2103.9	688				2103.3	685				3150

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
550	597.50	1118				597.49	1118				990
560	608.71	1121				608.70	1121				1008
570	619.94	1123				619.93	1123				1026
580	631.19	1125				631.18	1125				1044
590	642.47	1128				642.46	1128				1062
600	653.77	1130	-42.9	-85.7	-434.8	653.77	1131	-42.9	-85.7	-434.8	1080
610	665.10	1133				665.09	1132				1098
620	676.45	1135				676.44	1135				1116
630	687.83	1138				687.83	1139				1134
640	699.24	1141				699.24	1141				1152
650	710.67	1143				710.67	1143				1170
660	722.12	1145				722.12	1145				1188
670	733.60	1148				733.60	1148				1206
680	745.10	1150				745.10	1150				1224
690	756.64	1154				756.64	1154				1242
700	768.20	1156	-42.5	-85.0	-431.4	768.21	1157	-42.5	-85.0	-431.4	1260
710	779.78	1158				779.79	1158				1278
720	791.38	1160				791.39	1160				1296
730	803.03	1165				803.04	1165				1314
740	814.68	1165				814.69	1165				1332
750	826.37	1169				826.38	1169				1350
760	838.10	1173				838.11	1173				1368
770	849.84	1174				849.85	1174				1386
780	861.58	1174				861.59	1174				1404
790	873.38	1180				873.39	1180				1422
800	885.21	1183	-42.2	-84.2	-427.8	885.21	1182	-42.2	-84.2	-427.8	1440
850	944.6	594				944.6	594				1530
900	1004.7	601	-41.8	-83.4	-424.1	1004.7	601	-41.8	-83.4	-424.0	1620
950	1065.3	606				1065.3	606				1710
1000	1126.5	612	-41.4	-82.7	-420.2	1126.5	612	-41.4	-82.7	-420.2	1800
1050	1188.2	617				1188.2	617				1890
1100	1250.5	623	-41.0	-82.0	-416.2	1250.5	623	-41.0	-81.9	-416.2	1980
1150	1313.3	628				1313.3	628				2070
1200	1376.5	632	-40.7	-81.1	-412.0	1376.5	632	-40.6	-81.1	-412.0	2160
1250	1440.2	637				1440.2	637				2250
1300	1504.5	643	-40.2	-80.2	-407.6	1504.5	643	-40.3	-80.2	-407.6	2340
1350	1569.1	646				1569.1	646				2430
1400	1634.2	651	-39.8	-79.3	-403.0	1634.2	651	-39.7	-79.3	-403.0	2520
1450	1699.8	656				1699.8	656				2610
1500	1765.8	660	-39.2	-78.2	-398.0	1765.8	660	-39.2	-78.2	-398.0	2700
1550	1832.3	665				1832.3	665				2790
1600	1899.3	670	-38.4	-77.3	-392.7	1899.3	670	-38.3	-77.3	-392.8	2880
1650	1966.8	675				1966.8	675				2970
1700	2034.8	680	-37.8	-75.7	-386.8	2034.8	680	-37.8	-75.8	-387.0	3060
1750	2103.3	685				2103.3	685				3150

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2173.3	694	-36.1	-73.1	-378.3	2172.5	692	-36.8	-73.8	-379.8	3240
1850	2243.6	703				2242.3	698				3330
1900	2314.8	712	-34.4	-70.3	-368.6	2312.7	704	-35.2	-71.5	-371.6	3420
1950	2387.3	725				2384.0	713				3510
2000	2461.2	739	-32.0	-66.2	-356.5	2456.3	723	-33.4	-68.5	-361.6	3600
2050	2536.9	757				2529.6	733				3690
2100	2614.5	776	-28.6	-60.7	-340.2	2604.2	746	-31.0	-64.5	-349.3	3780
2150	2694.6	801				2680.1	759				3870
2200	2777.8	832	-23.4	-53.3	-318.0	2757.8	777	-27.4	-59.1	-333.1	3960
2250	2864.7	869				2837.7	799				4050
2300	2956.3	916	-17.4	-43.3	-288.6	2920.1	824	-23.0	-51.9	-312.6	4140
2350	3053.1	968				3005.5	854				4230
2400	3156.1	1030	- 9.2	-29.7	-247.6	3094.1	886	-17.3	-43.1	-285.9	4320
2450	3266.5	1104				3186.7	926				4410
2500	3385.7	1192	1.2	-12.0	-191.9	3283.8	971	-10.3	-31.6	-251.4	4500
2550	3514.0	1283				3386.1	1023				4590
2600	3652.8	1388	13.2	10.1	-115.6	3493.8	1077	- 2.1	-17.3	-206.1	4680
2650	3804.5	1517				3607.6	1138				4770
2700	3969.1	1646	26.2	35.9	- 16.4	3727.9	1203	7.5	.0	-148.4	4860
2750	4148.0	1789				3855.4	1275				4950
2800	4342.2	1942	39.6	64.1	110.7	3990.7	1353	18.1	19.9	- 74.4	5040
2850											5130
2900	4773.8	4316	52.7	93.7	263.9	4312.6	3219	29.1	42.5	17.8	5220
2950											5310
3000	5270.7	4969	65.2	122.5	436.1	4668.9	3563	40.2	66.3	128.8	5400

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2172.4	691	-36.9	-74.0	-380.3	2172.4	691	-37.0	-74.2	-380.6	3240
1850	2242.0	696				2242.0	696				3330
1900	2312.3	703	-35.5	-71.9	-372.5	2312.2	702	-35.7	-72.2	-373.1	3420
1950	2383.3	710				2383.1	709				3510
2000	2455.1	718	-33.9	-69.2	-363.3	2454.8	717	-34.1	-69.6	-364.2	3600
2050	2527.8	727				2527.2	724				3690
2100	2601.5	737	-31.7	-65.6	-352.0	2600.5	733	-32.0	-66.2	-353.4	3780
2150	2676.3	748				2675.0	745				3870
2200	2752.6	763	-28.4	-60.6	-337.2	2750.7	757	-29.1	-61.5	-339.6	3960
2250	2830.7	781				2827.9	772				4050
2300	2910.8	801	-24.6	-54.4	-319.3	2906.9	790	-25.5	-55.8	-323.0	4140
2350	2993.2	824				2988.0	811				4230
2400	3078.3	851	-19.6	-46.8	-296.3	3071.5	835	-20.9	-48.9	-301.9	4320
2450	3166.5	882				3157.5	860				4410
2500	3258.2	917	-13.7	-37.1	-267.1	3246.8	893	-15.5	-40.0	-275.5	4500
2550	3353.9	957				3339.4	926				4590
2600	3453.6	997	- 6.6	-24.8	-229.4	3436.1	967	- 9.1	-29.0	-241.7	4680
2650	3557.9	1043				3537.3	1012				4770
2700	3667.3	1094	2.1	-10.1	-182.1	3643.6	1063	- 1.2	-15.8	-199.8	4860
2750	3782.3	1150				3755.6	1120				4950
2800	3903.2	1209	11.2	6.9	-122.1	3873.9	1183	7.3	- .2	-146.9	5040
2850						3999.2	1253				5130
2900	4190.8	2876	21.1	26.5	- 46.8	4132.1	1329	16.6	17.6	- 80.5	5220
2950						4273.1	1410				5310
3000	4504.3	3135	31.5	47.6	43.3	4422.7	1496	26.4	37.0	- 2.0	5400

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			H_T Residuals, for mole % moisture content					H_T Residuals, for mole % moisture content			
	$H_T \times 10^{-4}$	Δ	0.1	1.0	5.0	$H_T \times 10^{-4}$	Δ	0.1	1.0	5.0	
3100	5817.0	5463	77.1			5071.1	4022	50.8	90.7	256.6	5580
3200						5518.5	4474	61.3	114.4	398.2	5760
3300						6006.8	4883	71.4	138.0	548.1	5940
3400						6526.1	5193	81.3	160.5	698.6	6120
3500						7061.8	5357	91.8	182.0	838.9	6300
3600						7606.1	5443	101.1	202.0	967.7	6480
3700						8149.8	5437	110.4	220.4	1081.9	6660
3800						8690.9	5411	119.2	238.3	1180.2	6840
3900						9236.8	5459	125.7	252.7	1261.6	7020
4000						9802.6	5658	131.9	264.6	1330.5	7200
4100						10403.	600	136.	275.	1385.	7380
4200						11060.	657	141.	284.	1428.	7560
4300						11792.	732	144.	292.	1465.	7740
4400						12617.	825	148.	298.	1496.	7920
4500						13550.	933	150.	302.	1523.	8100
4600						14597.	1047	151.	307.	1545.	8280
4700						15761.	1164	155.	309.	1563.	8460
4800						17040.	1279	158.	314.	1577.	8640
4900						18426.	1386	157.	314.	1578.	8820
5000						19890.	1464	157.	311.	1569.	9000

Table 1510.04 ENTHALPY (H_T in ft-lb_F/slug) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
	H_T x10^{-4}	Δ	H_T Residuals, for mole % moisture content 0.1	1.0	5.0	H_T x10^{-4}	Δ	H_T Residuals, for mole % moisture content 0.1	1.0	5.0	
3100	4857.5	3532	41.3	69.8	149.6	4743.7	3210	35.6	57.6	91.6	5580
3200	5252.2	3947	51.2	91.9	270.8	5107.4	3637	45.1	78.5	199.8	5760
3300	5687.8	4356	60.7	114.4	403.7	5510.1	4027	54.3	100.1	320.6	5940
3400	6159.1	4713	70.4	136.2	542.7	5949.1	4330	63.7	121.3	449.5	6120
3500	6655.7	4966	80.3	157.2	679.4	6416.7	4676	73.3	141.7	580.5	6300
3600	7170.3	5146	89.8	177.6	811.2	6907.1	4904	82.5	161.8	710.0	6480
3700	7693.9	5236	98.8	196.7	934.5	7412.5	5054	91.2	180.9	835.0	6660
3800	8219.5	5256	108.0	215.9	1046.3	7924.8	5123	100.4	200.4	951.7	6840
3900	8748.5	5290	115.8	232.3	1143.7	8442.8	5180	108.7	217.6	1056.7	7020
4000	9287.8	5393	123.0	246.8	1229.6	8969.3	5265	116.3	233.4	1151.8	7200
4100	9845.0	5572	128.7	259.8	1300.7	9507.8	5385	122.8	247.7	1233.2	7380
4200	10437.	592	135.	271.	1359.	10071.	563	130.	261.	1303.	7560
4300	11077.	640	139.	281.	1410.	10669.	598	135.	272.	1362.	7740
4400	11780.	703	144.	289.	1452.	11315.	646	140.	282.	1414.	7920
4500	12564.	784	147.	295.	1489.	12025.	710	144.	289.	1458.	8100
4600	13436.	872	149.	302.	1519.	12808.	783	147.	297.	1495.	8280
4700	14406.	970	153.	306.	1546.	13673.	865	151.	303.	1527.	8460
4800	15480.	1074	157.	311.	1568.	14632.	959	155.	308.	1554.	8640
4900	16658.	1178	158.	315.	1582.	15687.	1055	157.	314.	1575.	8820
5000	17932.	1274	158.	314.	1587.	16836.	1149	157.	315.	1588.	9000

Table 1510.04 ENTHALPY (H_T in ft-lb_F/slug) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
90	94.83										162
100	105.94	1111									180
110	116.97	1103				112.51					198
120	127.91	1094				124.17	1166				216
130	138.88	1097				135.60	1143				234
140	149.77	1089				146.94	1134				252
150	160.66	1089				158.13	1119				270
160	171.54	1088				169.27	1114				288
170	182.40	1086				180.35	1108				306
180	193.24	1084				191.39	1104				324
190	204.08	1084				202.38	1099				342
200	214.92	1084				213.36	1098				360
210	225.75	1083				224.32	1096				378
220	236.57	1082				235.26	1094				396
230	247.40	1083				246.18	1092				414
240	258.23	1083				257.09	1091				432
250	269.13	1090				267.99	1090				450
260	279.87	1074				278.89	1090				468
270	290.69	1082				289.78	1089				486
280	301.52	1083				300.66	1088				504
290	312.35	1083				311.55	1089				522
300	323.17	1082	-43.7	-87.5	-444.1	322.43	1088	-43.7	-87.5	-444.4	540
310	334.01	1084				333.32	1089				558
320	344.85	1084				344.21	1089				576
330	355.69	1084				355.09	1088				594
340	366.55	1086				365.98	1089				612
350	377.40	1085				376.88	1090				630
360	388.27	1087				387.78	1090				648
370	399.16	1089				398.69	1091				666
380	410.03	1087				409.61	1092				684
390	420.93	1090				420.54	1093				702
400	431.83	1090	-43.4	-8	-1.0	431.48	1094	-43.3	-86.8	-440.8	720
410	442.76	1093				442.43	1095				738
420	453.70	1094				453.39	1096				756
430	464.65	1095				464.36	1097				774
440	475.62	1097				475.34	1098				792
450	486.61	1099				486.35	1101				810
460	497.60	1099				497.37	1102				828
470	508.62	1102				508.41	1104				846
480	519.64	1102				519.46	1105				864
490	530.71	1107				530.54	1108				882
500	541.79	1108	-43.1	-86.2	-437.9	541.63	1109	-43.1	-86.2	-437.8	900
510	552.89	1110				552.73	1110				918
520	564.01	1112				563.87	1114				936
530	575.15	1114				575.02	1115				954
540	586.31	1116				586.20	1118				972

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
110	107.45					101.39					198
120	120.01	1256				115.40	1401				216
130	132.11	1210				128.35	1295				234
140	143.96	1185				140.72	1237				252
150	155.47	1151				152.74	1202				270
160	166.90	1143				164.51	1177				288
170	178.23	1133				176.10	1159				306
180	189.47	1124				187.56	1146				324
190	200.65	1118				198.92	1136				342
200	211.79	1114				210.22	1130				360
210	222.88	1109				221.44	1122				378
220	233.93	1105				232.62	1118				396
230	244.96	1103				243.75	1113				414
240	255.97	1101				254.85	1110				432
250	266.96	1099				265.92	1107				450
260	277.93	1097				276.97	1105				468
270	288.88	1095				288.00	1103				486
280	299.83	1095				299.01	1101				504
290	310.77	1094				310.01	1100				522
300	321.70	1093	-43.7	-87.6	-444.7	321.00	1099	-43.8	-87.6	-445.0	540
310	332.63	1093				331.98	1098				558
320	343.56	1093				342.95	1097				576
330	354.49	1093				353.92	1097				594
340	365.42	1093				364.89	1097				612
350	376.35	1093				375.86	1097				630
360	387.29	1094				386.83	1097				648
370	398.23	1094				397.81	1098				666
380	409.17	1094				408.79	1098				684
390	420.13	1096				419.77	1098				702
400	431.09	1096	-43.3	-86.7	-440.6	430.75	1098	-43.3	-86.7	-440.5	720
410	442.06	1097				441.75	1100				738
420	453.05	1099				452.76	1101				756
430	464.05	1100				463.78	1102				774
440	475.05	1100				474.81	1103				792
450	486.08	1103				485.85	1104				810
460	497.12	1104				496.90	1105				828
470	508.17	1105				507.98	1108				846
480	519.24	1107				519.07	1109				864
490	530.33	1109				530.17	1110				882
500	541.44	1111	-43.0	-86.2	-437.8	541.30	1113	-43.1	-86.3	-437.9	900
510	552.57	1113				552.44	1114				918
520	563.72	1115				563.60	1116				936
530	574.89	1117				574.78	1118				954
540	586.08	1119				585.98	1120				972

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
550	597.49	1118				597.40	1120				990
560	608.70	1121				608.61	1121				1008
570	619.93	1123				619.85	1124				1026
580	631.18	1125				631.12	1127				1044
590	642.46	1128				642.41	1129				1062
600	653.77	1131	-42.9	-85.7	-434.8	653.73	1132	-42.8	-85.7	-434.7	1080
610	665.09	1132				665.07	1134				1098
620	676.44	1135				676.44	1137				1116
630	687.83	1139				687.83	1139				1134
640	699.24	1141				699.24	1141				1152
650	710.67	1143				710.67	1143				1170
660	722.12	1145				722.14	1147				1188
670	733.60	1148				733.62	1148				1206
680	745.10	1150				745.13	1151				1224
690	756.64	1154				756.67	1154				1242
700	768.21	1157	-42.5	-85.0	-431.4	768.24	1157	-42.5	-85.0	-431.4	1260
710	779.79	1158				779.84	1160				1278
720	791.39	1160				791.46	1162				1296
730	803.04	1165				803.11	1165				1314
740	814.69	1165				814.78	1167				1332
750	826.38	1169				826.48	1170				1350
760	838.11	1173				838.20	1172				1368
770	849.85	1174				849.95	1175				1386
780	861.59	1174				861.72	1177				1404
790	873.39	1180				873.52	1180				1422
800	885.21	1182	-42.2	-84.2	-427.8	885.34	1182	-42.2	-84.3	-427.8	1440
850	944.6	594				944.7	594				1530
900	1004.7	601	-41.8	-83.4	-424.0	1004.8	601	-41.8	-83.5	-424.1	1620
950	1065.3	606				1065.5	607				1710
1000	1126.5	612	-41.4	-82.7	-420.2	1126.7	612	-41.4	-82.7	-420.3	1800
1050	1188.2	617				1188.4	617				1890
1100	1250.5	623	-41.0	-81.9	-416.2	1250.7	623	-41.1	-82.0	-416.2	1980
1150	1313.3	628				1313.5	628				2070
1200	1376.5	632	-40.6	-81.1	-412.0	1376.7	632	-40.7	-81.1	-412.0	2160
1250	1440.2	637				1440.4	637				2250
1300	1504.5	643	-40.3	-80.2	-407.6	1504.6	642	-40.2	-80.2	-407.6	2340
1350	1569.1	646				1569.3	647				2430
1400	1634.2	651	-39.7	-79.3	-403.0	1634.3	650	-39.7	-79.3	-403.0	2520
1450	1699.8	656				1699.9	656				2610
1500	1765.8	660	-39.2	-78.2	-398.0	1765.9	660	-39.2	-78.3	-398.2	2700
1550	1832.3	665				1832.4	665				2790
1600	1899.3	670	-38.3	-77.3	-392.8	1899.4	670	-38.7	-77.3	-393.1	2880
1650	1966.8	675				1967.0	676				2970
1700	2034.8	680	-37.8	-75.8	-387.0	2035.0	680	-38.0	-76.0	-387.5	3060
1750	2103.3	685				2103.4	684				3150

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air
(Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
550	597.29	1121				597.20	1122				990
560	608.52	1123				608.44	1124				1008
570	619.78	1126				619.71	1127				1026
580	631.06	1128				631.00	1129				1044
590	642.36	1130				642.31	1131				1062
600	653.69	1133	-42.8	-85.6	-434.7	653.65	1134	-42.8	-85.6	-434.6	1080
610	665.04	1135				665.01	1136				1098
620	676.42	1138				676.39	1138				1116
630	687.82	1140				687.80	1141				1134
640	699.25	1143				699.23	1143				1152
650	710.70	1145				710.68	1145				1170
660	722.18	1148				722.16	1148				1188
670	733.67	1149				733.66	1150				1206
680	745.19	1152				745.19	1153				1224
690	756.74	1155				756.75	1156				1242
700	768.31	1157	-42.5	-85.0	-431.3	768.33	1158	-42.4	-85.0	-431.3	1260
710	779.91	1160				779.93	1160				1278
720	791.53	1162				791.56	1163				1296
730	803.17	1164				803.22	1166				1314
740	814.85	1168				814.90	1168				1332
750	826.54	1169				826.60	1170				1350
760	838.27	1173				838.33	1173				1368
770	850.01	1174				850.09	1176				1386
780	861.79	1178				861.87	1178				1404
790	873.59	1180				873.68	1181				1422
800	885.42	1183	-42.2	-84.3	-427.9	885.51	1183	-42.1	-84.2	-427.8	1440
850	944.9	595				945.0	595				1530
900	1005.0	601	-41.8	-83.5	-424.1	1005.1	601	-41.8	-83.5	-424.1	1620
950	1065.7	607				1065.8	607				1710
1000	1126.9	612	-41.4	-82.7	-420.2	1127.0	612	-41.4	-82.7	-420.3	1800
1050	1188.6	617				1188.8	618				1890
1100	1250.9	623	-41.1	-82.0	-416.3	1251.1	623	-41.0	-82.0	-416.2	1980
1150	1313.7	628				1313.9	628				2070
1200	1377.0	633	-40.6	-81.1	-412.1	1377.2	633	-40.7	-81.1	-412.1	2160
1250	1440.7	637				1440.9	637				2250
1300	1505.0	643	-40.2	-80.2	-407.6	1505.1	642	-40.1	-80.2	-407.6	2340
1350	1569.6	646				1569.9	648				2430
1400	1634.8	652	-39.7	-79.4	-403.1	1635.0	651	-39.7	-79.3	-403.1	2520
1450	1700.3	655				1700.6	656				2610
1500	1766.3	660	-39.3	-78.4	-398.3	1766.6	660	-39.2	-78.3	-398.3	2700
1550	1832.9	666				1833.1	665				2790
1600	1899.9	670	-38.8	-77.2	-393.2	1900.1	670	-38.8	-77.2	-393.2	2880
1650	1967.3	674				1967.5	674				2970
1700	2035.3	680	-38.1	-76.2	-387.8	2035.5	680	-38.1	-76.2	-387.9	3060
1750	2103.8	685				2103.9	684				3150

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2172.4	691	-37.0	-74.2	-380.6	2172.4	690	-37.1	-74.5	-381.5	3240
1850	2242.0	696				2241.8	694				3330
1900	2312.2	702	-35.7	-72.2	-373.1	2311.8	700	-36.1	-72.8	-374.8	3420
1950	2383.1	709				2382.4	706				3510
2000	2454.8	717	-34.1	-69.6	-364.2	2453.5	711	-35.0	-70.8	-367.1	3600
2050	2527.2	724				2525.3	718				3690
2100	2600.5	733	-32.0	-66.2	-353.4	2597.8	725	-33.2	-67.9	-357.9	3780
2150	2675.0	745				2671.1	733				3870
2200	2750.7	757	-29.1	-61.5	-339.6	2745.2	741	-31.1	-64.4	-346.8	3960
2250	2827.9	772				2820.2	750				4050
2300	2906.9	790	-25.5	-55.8	-323.0	2896.3	761	-28.5	-60.4	-334.0	4140
2350	2988.0	811				2973.7	774				4230
2400	3071.5	835	-20.9	-48.9	-301.9	3052.6	789	-25.1	-55.2	-318.2	4320
2450	3157.5	860				3132.9	803				4410
2500	3246.8	893	-15.5	-40.0	-275.5	3214.9	820	-21.2	-48.8	-299.3	4500
2550	3339.4	926				3298.9	840				4590
2600	3436.1	967	- 9.1	-29.0	-241.7	3385.2	863	-16.4	-41.0	-275.8	4680
2650	3537.3	1012				3474.0	888				4770
2700	3643.6	1063	- 1.2	-15.8	-199.8	3565.4	914	-10.7	-31.9	-248.0	4860
2750	3755.6	1120				3659.9	945				4950
2800	3873.9	1183	7.3	- .2	-146.9	3758.0	981	- 4.6	-21.1	-214.2	5040
2850	3999.2	1253				3859.6	1016				5130
2900	4132.1	1329	16.6	17.6	- 80.5	3965.4	1058	2.4	- 8.9	-172.9	5220
2950	4273.1	1410				4075.7	1103				5310
3000	4422.7	1496	26.4	37.0	- 2.0	4190.7	1150	9.9	4.7	-125.5	5400

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2172.7	689	-37.3	-74.7	-381.9	2172.9	690	-37.3	-74.7	-382.1	3240
1850	2242.1	694				2242.3	694				3330
1900	2312.0	699	-36.3	-73.0	-375.3	2312.1	698	-36.4	-73.1	-375.6	3420
1950	2382.4	704				2382.6	705				3510
2000	2453.4	710	-35.3	-71.2	-368.1	2453.6	710	-35.5	-71.4	-368.6	3600
2050	2525.0	716				2525.2	716				3690
2100	2597.2	722	-33.7	-68.6	-359.4	2597.3	721	-34.0	-68.9	-360.2	3780
2150	2670.2	730				2670.2	729				3870
2200	2743.7	735	-31.8	-65.5	-349.1	2743.7	735	-32.1	-66.1	-350.4	3960
2250	2818.2	745				2817.9	742				4050
2300	2893.6	754	-29.5	-61.9	-337.4	2893.0	751	-30.0	-62.7	-339.3	4140
2350	2969.7	761				2969.1	761				4230
2400	3047.3	776	-26.5	-57.2	-323.1	3046.1	770	-27.3	-58.3	-325.8	4320
2450	3126.2	789				3124.4	783				4410
2500	3206.6	804	-23.0	-51.5	-306.3	3203.8	794	-24.0	-53.0	-310.0	4500
2550	3288.4	818				3284.7	809				4590
2600	3372.1	837	-18.7	-44.6	-285.6	3367.0	823	-19.9	-46.7	-290.9	4680
2650	3457.7	856				3451.2	842				4770
2700	3545.4	877	-13.9	-36.7	-261.5	3537.2	860	-15.5	-39.3	-268.8	4860
2750	3635.4	900				3625.3	881				4950
2800	3728.1	927	- 8.3	-27.3	-232.5	3715.7	904	-10.4	-30.7	-242.4	5040
2850	3823.6	955				3808.6	929				5130
2900	3922.3	987	- 2.0	-16.7	-198.0	3904.4	958	- 4.6	-21.0	-211.4	5220
2950	4024.5	1022				4003.6	992				5310
3000	4130.4	1059	4.6	- 4.8	-158.0	4105.8	1022	1.6	-10.0	-175.1	5400

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	H_T x10^{-4}	Δ	H_T Residuals, for mole % moisture content 0.1	1.0	5.0	H_T x10^{-4}	Δ	H_T Residuals, for mole % moisture content 0.1	1.0	5.0	
3100	4743.7	3210	35.6	57.6	91.6	4434.1	2434	17.4	19.7	- 69.0	5580
3200	5107.4	3637	45.1	78.5	199.8	4704.0	2699	25.2	35.8	- 2.6	5760
3300	5510.1	4027	54.3	100.1	320.6	5000.5	2965	32.8	52.6	74.0	5940
3400	5949.1	4390	63.7	121.3	449.5	5325.3	3248	40.8	70.0	159.8	6120
3500	6416.7	4676	73.3	141.7	580.5	5678.4	3531	48.5	87.1	255.1	6300
3600	6907.1	4904	82.5	161.8	710.0	6059.8	3814	56.0	104.3	356.9	6480
3700	7412.5	5054	91.2	180.9	835.0	6468.4	4086	63.4	121.5	464.1	6660
3800	7924.8	5123	100.4	200.4	951.7	6898.9	4305	71.1	139.0	573.9	6840
3900	8442.8	5180	108.7	217.6	1056.7	7347.7	4488	79.7	156.2	683.2	7020
4000	8969.3	5265	116.3	233.4	1151.8	7811.9	4642	87.2	173.6	791.0	7200
4100	9507.8	5385	122.8	247.7	1233.2	8286.1	4742	95.2	190.4	893.1	7380
4200	10071.	563	130.	261.	1303.	8773.0	4869	103.4	206.5	990.1	7560
4300	10669.	598	135.	272.	1362.	9270.0	4970	110.8	221.5	1080.0	7740
4400	11315.	646	140.	282.	1414.	9782.6	5126	117.9	235.9	1161.9	7920
4500	12025.	710	144.	289.	1458.	10317.	534	124.	249.	1236.	8100
4600	12808.	783	147.	297.	1495.	10878.	561	130.	261.	1302.	8280
4700	13673.	865	151.	303.	1527.	11474.	596	135.	272.	1360.	8460
4800	14632.	959	155.	308.	1554.	12114.	640	141.	282.	1411.	8640
4900	15687.	1055	157.	314.	1575.	12807.	693	144.	290.	1457.	8820
5000	16836.	1149	157.	315.	1588.	13557.	750	147.	298.	1498.	9000

Table 1510.04 ENTHALPY (H_T in ft-lb$_F$/slug) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	H_T x10^{-4}	Δ	H_T Residuals, for mole % moisture content 0.1	1.0	5.0	H_T x10^{-4}	Δ	H_T Residuals, for mole % moisture content 0.1	1.0	5.0	
3100	4355.4	2250	11.6	8.4	-110.9	4315.5	2097	8.2	2.1	-132.9	5580
3200	4599.7	2443	18.6	22.5	- 56.4	4546.5	2310	14.9	15.1	- 84.3	5760
3300	4865.5	2658	25.7	37.3	6.7	4796.2	2497	21.6	28.7	- 28.3	5940
3400	5154.6	2891	33.0	53.0	77.8	5066.1	2699	28.5	43.3	34.7	6120
3500	5468.1	3135	40.2	68.7	157.5	5357.5	2914	35.4	58.1	105.2	6300
3600	5807.3	3392	47.0	84.4	244.5	5672.3	3148	41.6	72.8	182.8	6480
3700	6172.7	3654	53.8	100.2	337.8	6011.1	3388	48.3	87.9	266.9	6660
3800	6561.0	3933	61.0	116.3	436.1	6372.3	3612	55.0	102.9	356.6	6840
3900	6970.1	4091	68.6	132.2	537.1	6754.4	3821	62.1	118.0	450.5	7020
4000	7398.0	4279	75.5	148.6	639.3	7156.8	4024	68.5	133.3	546.7	7200
4100	7839.1	4411	83.1	165.0	739.2	7574.2	4174	75.8	149.2	642.6	7380
4200	8294.8	4557	91.0	180.8	837.5	8008.1	4339	83.1	164.5	738.9	7560
4300	8760.1	4653	98.6	196.2	931.5	8452.7	4446	90.6	179.8	832.7	7740
4400	9238.3	4782	105.8	211.4	1019.6	8910.5	4578	97.7	194.8	922.2	7920
4500	9731.8	4935	112.2	226.2	1101.6	9381.7	4712	104.4	210.1	1007.5	8100
4600	10244.	512	119.	239.	1177.	9868.7	4870	111.1	223.1	1086.9	8280
4700	10779.	535	125.	252.	1246.	10373.	504	117.	237.	1161.	8460
4800	11343.	564	131.	263.	1308.	10901.	528	124.	249.	1230.	8640
4900	11944.	601	135.	272.	1363.	11457.	556	129.	259.	1291.	8820
5000	12587.	643	140.	283.	1415.	12048.	591	134.	271.	1349.	9000

Table 1510.04 ENTHALPY (H_T in ft-lb$_F$/slug) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
110	101.39										198
120	115.40	1401									216
130	128.35	1295									234
140	140.72	1237									252
150	152.74	1202									270
160	164.51	1177				134.15					288
170	176.10	1159				150.96	1681				306
180	187.56	1146				166.02	1506				324
190	198.92	1136				180.05	1403				342
200	210.22	1130				193.46	1341				360
210	221.44	1122				206.39	1293				378
220	232.62	1118				219.00	1261				396
230	243.75	1113				231.36	1236				414
240	254.85	1110				243.50	1214				432
250	265.92	1107				255.50	1200				450
260	276.97	1105				267.34	1184				468
270	288.00	1103				279.08	1174				486
280	299.01	1101				290.78	1170				504
290	310.01	1100				302.39	1161				522
300	321.00	1099	-43.8	-87.6	-445.0	313.91	1152				540
310	331.98	1098				325.38	1147				558
320	342.95	1097				336.82	1144				576
330	353.92	1097				348.21	1139				594
340	364.89	1097				359.56	1135				612
350	375.86	1097				370.87	1131				630
360	386.83	1097				382.16	1129				648
370	397.81	1098				393.44	1128				666
380	408.79	1098				404.72	1128				684
390	419.77	1098				415.98	1126				702
400	430.75	1098	-43.3	-86.7	-440.5	427.24	1126				720
410	441.75	1100				438.49	1125				738
420	452.76	1101				449.74	1125				756
430	463.78	1102				460.99	1125				774
440	474.81	1103				472.22	1123				792
450	485.85	1104				483.44	1122				810
460	496.90	1105				494.68	1124				828
470	507.98	1108				505.92	1124				846
480	519.07	1109				[illegible].18	1126				864
490	530.17	1110				[illegible].44	1126				882
500	541.30	1113	-43.1	-86.3	-437.9	539.73	1129	-43.1	-86.2	-437.5	900
510	552.44	1114				551.02	1129				918
520	563.60	1116				562.32	1130				936
530	574.78	1118				573.64	1132				954
540	585.98	1120				584.96	1132				972

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
180	140.12					114.32					324
190	158.90	1878				138.08	2376				342
200	175.50	1660				158.11	2003				360
210	190.78	1528				175.87	1776				378
220	205.21	1443				192.18	1631				396
230	219.03	1382				207.47	1529				414
240	232.43	1340				222.12	1465				432
250	245.41	1298				236.08	1396				450
260	257.98	1257				249.65	1357				468
270	270.57	1259				262.95	1330				486
280	283.03	1246				275.94	1299				504
290	295.26	1223				288.73	1279				522
300	307.30	1204				301.29	1256				540
310	319.24	1194				313.73	1244				558
320	331.12	1188				326.04	1231				576
330	342.92	1180				338.25	1221				594
340	354.66	1174				350.35	1210				612
350	366.34	1168				362.36	1201				630
360	377.96	1162				374.28	1192				648
370	389.54	1158				386.14	1186				666
380	401.09	1155				397.93	1179				684
390	412.62	1153				409.66	1173				702
400	424.11	1149				421.36	1170				720
410	435.59	1148				433.05	1169				738
420	447.05	1146				444.71	1166				756
430	458.49	1144				456.34	1163				774
440	469.92	1143				467.95	1161				792
450	481.34	1142				479.54	1159				810
460	492.76	1142				491.12	1158				828
470	504.17	1141				502.69	1157				846
480	515.58	1141				514.26	1157				864
490	526.99	1141				525.81	1155				882
500	538.41	1142				537.36	1155				900
510	549.84	1143				548.90	1154				918
520	561.27	1143				560.46	1156				936
530	572.72	1145				572.02	1156				954
540	584.18	1146				583.59	1157				972

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
550	597.20	1122				596.31	1135				990
560	608.44	1124				607.68	1137				1008
570	619.71	1127				619.05	1137				1026
580	631.00	1129				630.45	1140				1044
590	642.31	1131				641.87	1142				1062
600	653.65	1134	-42.8	-85.6	-434.6	653.30	1143	-42.8	-85.5	-434.6	1080
610	665.01	1136				664.75	1145				1098
620	676.39	1138				676.23	1148				1116
630	687.80	1141				687.74	1151				1134
640	699.23	1143				699.26	1152				1152
650	710.68	1145				710.79	1153				1170
660	722.16	1148				722.35	1156				1188
670	733.66	1150				733.94	1159				1206
680	745.19	1153				745.55	1161				1224
690	756.75	1156				757.18	1163				1242
700	768.33	1158	-42.4	-85.0	-431.3	768.82	1164	-42.4	-84.9	-431.3	1260
710	779.93	1160				780.50	1168				1278
720	791.56	1163				792.19	1169				1296
730	803.22	1166				803.92	1173				1314
740	814.90	1168				815.66	1174				1332
750	826.60	1170				827.43	1177				1350
760	838.33	1173				839.22	1179				1368
770	850.09	1176				851.04	1182				1386
780	861.87	1178				862.88	1184				1404
790	873.68	1181				874.73	1185				1422
800	885.51	1183	-42.1	-84.2	-427.8	886.62	1189	-42.1	-84.1	-427.8	1440
850	945.0	595				946.3	597				1530
900	1005.1	601	-41.8	-83.5	-424.1	1006.7	604	-41.8	-83.4	-424.1	1620
950	1065.8	607				1067.5	608				1710
1000	1127.0	612	-41.4	-82.7	-420.3	1129.0	615	-41.4	-82.8	-420.3	1800
1050	1188.8	618				1190.9	619				1890
1100	1251.1	623	-41.0	-82.0	-416.2	1253.4	625	-40.9	-82.0	-416.3	1980
1150	1313.9	628				1316.3	629				2070
1200	1377.2	633	-40.7	-81.1	-412.1	1379.6	633	-40.6	-81.1	-412.2	2160
1250	1440.9	637				1443.5	639				2250
1300	1505.1	642	-40.1	-80.2	-407.6	1507.8	643	-40.2	-80.2	-407.8	2340
1350	1569.9	648				1572.7	649				2430
1400	1635.0	651	-39.7	-79.3	-403.1	1637.9	652	-39.8	-79.4	-403.2	2520
1450	1700.6	656				1703.6	657				2610
1500	1766.6	660	-39.2	-78.3	-398.3	1769.6	660	-39.3	-78.5	-398.4	2700
1550	1833.1	665				1836.2	666				2790
1600	1900.1	670	-38.8	-77.2	-393.2	1903.2	670	-38.7	-77.4	-393.5	2880
1650	1967.5	674				1970.8	676				2970
1700	2035.5	680	-38.1	-76.2	-387.9	2038.7	679	-38.2	-76.3	-388.3	3060
1750	2103.9	684				2107.1	684				3150

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air
(Continued) (See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
550	595.63	1145				595.15	1156				990
560	607.12	1149				606.74	1159				1008
570	618.60	1148				618.33	1159				1026
580	630.09	1149				629.91	1158				1044
590	641.60	1151				641.53	1162				1062
600	653.13	1153				653.15	1162				1080
610	664.69	1156				664.79	1164				1098
620	676.25	1156				676.43	1164				1116
630	687.83	1158				688.10	1167				1134
640	699.43	1160				699.77	1167				1152
650	711.05	1162				711.45	1168				1170
660	722.69	1164				723.15	1170				1188
670	734.35	1166				734.87	1172				1206
680	746.03	1168				746.61	1174				1224
690	757.72	1169				758.38	1177				1242
700	769.43	1171				770.15	1177				1260
710	781.17	1174				781.98	1183				1278
720	792.93	1176				793.82	1184				1296
730	804.72	1179				805.68	1186				1314
740	816.53	1181				817.55	1187				1332
750	828.35	1182				829.44	1189				1350
760	840.20	1185				841.34	1190				1368
770	852.06	1186				853.25	1191				1386
780	863.96	1190				865.17	1192				1404
790	875.86	1190				877.11	1194				1422
800	887.80	1194	-42.2	-84.2	-427.9	889.06	1195				1440
850	947.8	600				949.3	602				1530
900	1008.3	605	-41.8	-83.5	-424.2	1010.1	608				1620
950	1069.3	610				1071.3	612				1710
1000	1130.9	616	-41.3	-82.7	-420.4	1132.9	616				1800
1050	1193.0	621				1195.1	622				1890
1100	1255.6	626	-40.9	-82.0	-416.4	1257.9	628				1980
1150	1318.6	630				1321.0	631				2070
1200	1382.1	635	-40.6	-81.2	-412.3	1384.5	635	-40.7	-81.3	-412.6	2160
1250	1446.1	640				1448.6	641				2250
1300	1510.5	644	-40.2	-80.2	-407.9	1513.1	645	-40.2	-80.3	-408.0	2340
1350	1575.4	649				1578.0	649				2430
1400	1640.7	653	-39.8	-79.4	-403.4	1643.3	653	-39.8	-79.4	-403.5	2520
1450	1706.4	657				1709.1	658				2610
1500	1772.6	662	-39.4	-78.6	-398.5	1775.4	663	-39.4	-78.6	-398.7	2700
1550	1839.2	666				1842.1	667				2790
1600	1906.3	671	-38.7	-77.5	-393.7	1909.1	670	-38.6	-77.5	-393.8	2880
1650	1973.8	675				1976.7	676				2970
1700	2041.8	680	-38.2	-76.3	-388.5	2044.8	681	-38.2	-76.3	-388.7	3060
1750	2110.3	685				2113.3	685				3150

Table 1510.04 **ENTHALPY** ($H_T-U_o^o$ in ft-lb$_F$/slug) for dry and moist air
(Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ x10^{-4}	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2172.9	690	-37.3	-74.7	-382.1	2176.1	690	-37.6	-75.0	-382.7	3240
1850	2242.3	694				2245.5	694				3330
1900	2312.1	698	-36.4	-73.1	-375.6	2315.4	699	-36.7	-73.6	-376.5	3420
1950	2382.6	705				2385.7	703				3510
2000	2453.6	710	-35.5	-71.4	-368.6	2456.6	709	-35.7	-71.9	-370.0	3600
2050	2525.2	716				2528.0	714				3690
2100	2597.3	721	-34.0	-68.9	-360.2	2599.9	719	-35.0	-70.1	-362.9	3780
2150	2670.2	729				2672.4	725				3870
2200	2743.7	735	-32.1	-66.1	-350.4	2745.4	730	-33.3	-67.8	-354.3	3960
2250	2817.9	742				2819.0	736				4050
2300	2893.0	751	-30.0	-62.7	-339.3	2893.3	743	-31.7	-64.9	-344.9	4140
2350	2969.1	761				2968.2	749				4230
2400	3046.1	770	-27.3	-58.3	-325.8	3044.0	758	-29.6	-61.6	-334.1	4320
2450	3124.4	783				3120.4	764				4410
2500	3203.8	794	-24.0	-53.0	-310.0	3197.6	772	-26.9	-57.5	-321.6	4500
2550	3284.7	809				3275.7	781				4590
2600	3367.0	823	-19.9	-46.7	-290.9	3354.8	791	-24.0	-52.8	-306.9	4680
2650	3451.2	842				3434.9	801				4770
2700	3537.2	860	-15.5	-39.3	-268.8	3516.1	812	-20.6	-47.3	-290.4	4860
2750	3625.3	881				3598.5	824				4950
2800	3715.7	904	-10.4	-30.7	-242.4	3682.2	837	-16.8	-41.1	-271.3	5040
2850	3808.6	929				3767.4	852				5130
2900	3904.4	958	- 4.6	-21.0	-211.4	3854.1	867	-12.4	-33.8	-249.2	5220
2950	4003.6	992				3942.5	884				5310
3000	4105.8	1022	1.6	-10.0	-175.1	4032.8	903	- 7.6	-25.7	-223.7	5400

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air
(Continued) (See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
	$H_T-U_o^o$ $\times 10^{-4}$	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	$H_T-U_o^o$ $\times 10^{-4}$	Δ	$H_T-U_o^o$ Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2179.2	689	-37.8	-75.2	-383.1	2182.3	690	-37.7	-75.2	-383.2	3240
1850	2248.7	695				2251.7	694				3330
1900	2318.6	699	-36.8	-73.8	-377.0	2321.7	700	-36.9	-73.9	-377.3	3420
1950	2388.9	703				2392.1	704				3510
2000	2459.8	709	-35.9	-72.2	-370.6	2463.0	709	-35.9	-72.3	-370.9	3600
2050	2531.2	714				2534.4	714				3690
2100	2603.1	719	-35.2	-70.5	-363.8	2606.3	719	-35.3	-70.8	-364.3	3780
2150	2675.6	725				2678.7	724				3870
2200	2748.5	729	-33.6	-68.2	-355.5	2751.6	729	-33.9	-68.5	-356.4	3960
2250	2822.0	735				2825.0	734				4050
2300	2896.1	741	-32.1	-65.4	-346.7	2899.0	740	-32.3	-65.7	-347.7	4140
2350	2970.8	747				2973.5	745				4230
2400	3046.1	753	-30.2	-62.6	-336.7	3048.7	752	-30.6	-63.2	-338.2	4320
2450	3122.0	759				3124.5	758				4410
2500	3198.7	767	-27.8	-58.8	-325.0	3200.9	764	-28.3	-59.6	-327.0	4500
2550	3276.1	774				3278.1	772				4590
2600	3354.3	782	-25.3	-54.7	-311.8	3356.0	779	-26.0	-55.8	-314.5	4680
2650	3433.3	790				3434.6	786				4770
2700	3513.2	799	-22.0	-49.7	-296.7	3514.1	795	-22.9	-51.2	-300.4	4860
2750	3594.1	809				3594.5	804				4950
2800	3676.0	819	-18.9	-44.3	-279.8	3675.8	813	-20.0	-46.1	-284.5	5040
2850	3759.0	830				3758.2	824				5130
2900	3843.4	844	-14.9	-37.8	-259.9	3841.6	834	-16.4	-40.1	-265.9	5220
2950	3928.9	855				3926.2	846				5310
3000	4015.9	870	-10.5	-30.7	-238.1	4012.0	858	-12.1	-33.5	-246.2	5400

Table 1510.04 ENTHALPY ($H_T-U_o^o$ in ft-lb_F/slug) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			H_T Residuals, for mole % moisture content					H_T Residuals, for mole % moisture content			
	H_T x10^{-4}	Δ	0.1	1.0	5.0	H_T x10^{-4}	Δ	0.1	1.0	5.0	
3100	4315.5	2097	8.2	2.1	-132.9	4214.3	1815	- 2.4	-17.0	-194.8	5580
3200	4546.5	2310	14.9	15.1	- 84.3	4410.0	1957	2.8	- 7.5	-162.3	5760
3300	4796.2	2497	21.6	28.7	- 28.3	4616.2	2062	8.3	2.7	-125.5	5940
3400	5066.1	2699	28.5	43.3	34.7	4833.8	2176	13.9	13.4	- 84.6	6120
3500	5357.5	2914	35.4	58.1	105.2	5063.3	2295	19.5	24.8	- 40.3	6300
3600	5672.3	3148	41.6	72.8	182.8	5306.3	2430	24.6	36.0	8.5	6480
3700	6011.1	3388	48.3	87.9	266.9	5563.4	2571	30.3	48.0	62.1	6660
3800	6372.3	3612	55.0	102.9	356.6	5835.3	2719	35.6	59.5	120.1	6840
3900	6754.4	3821	62.1	118.0	450.5	6123.0	2877	40.6	71.3	183.3	7020
4000	7156.8	4024	68.5	133.3	546.7	6428.2	3052	45.8	83.0	250.2	7200
4100	7574.2	4174	75.8	149.2	642.6	6749.8	3216	51.2	95.1	320.1	7380
4200	8008.1	4339	83.1	164.5	738.9	7090.1	3403	56.6	107.5	394.7	7560
4300	8452.7	4446	90.6	179.8	832.7	7445.6	3555	62.4	120.2	471.5	7740
4400	8910.5	4578	97.7	194.8	922.2	7817.8	3722	68.0	133.2	550.5	7920
4500	9381.7	4712	104.4	210.1	1007.5	8204.7	3869	74.4	146.2	630.9	8100
4600	9868.7	4870	111.1	223.1	1086.9	8605.4	4007	80.1	159.1	710.0	8280
4700	10373.	504	117.	237.	1161.	9018.8	4134	86.5	172.2	790.1	8460
4800	10901.	528	124.	249.	1230.	9444.6	4258	92.9	185.6	869.3	8640
4900	11457.	556	129.	259.	1291.	9885.8	4412	99.3	198.1	942.7	8820
5000	12048.	591	134.	271.	1349.	10345.	459	106.	211.	1016.	9000

Table 1510.04 ENTHALPY (H_T in ft-lb$_F$/slug) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			H_T Residuals, for mole % moisture content					H_T Residuals, for mole % moisture content			
	H_T x10^{-4}	Δ	0.1	1.0	5.0	H_T x10^{-4}	Δ	0.1	1.0	5.0	
3100	4191.4	1755	- 5.9	-23.0	-213.3	4181.4	1694	- 8.0	-26.4	-223.9	5580
3200	4377.5	1861	- 1.2	-14.5	-185.6	4362.4	1810	- 3.6	-18.5	-198.8	5760
3300	4571.8	1943	3.9	- 5.3	-153.8	4550.2	1878	1.2	- 9.7	-170.0	5940
3400	4775.5	2037	9.2	4.3	-119.2	4746.5	1963	6.5	- .8	-138.5	6120
3500	4989.1	2136	14.3	14.4	- 80.8	4952.0	2055	11.1	8.3	-103.3	6300
3600	5213.7	2246	19.1	24.5	- 39.0	5167.3	2153	16.0	17.9	- 64.5	6480
3700	5450.3	2366	24.2	35.3	6.9	5394.0	2267	20.7	28.1	- 22.3	6660
3800	5698.8	2485	29.2	45.8	56.2	5631.6	2376	25.4	38.0	22.9	6840
3900	5960.6	2618	34.0	56.8	109.8	5881.0	2494	30.3	48.7	71.9	7020
4000	6236.1	2755	38.8	67.4	166.1	6141.6	2606	35.0	58.9	122.8	7200
4100	6524.8	2887	43.9	78.2	225.8	6413.0	2714	39.9	68.9	176.9	7380
4200	6829.4	3046	48.7	89.7	289.6	6697.4	2844	44.4	79.8	234.2	7560
4300	7147.9	3185	53.5	100.6	355.4	6993.6	2962	48.8	90.0	293.3	7740
4400	7481.6	3337	58.5	112.6	425.2	7303.0	3094	53.3	101.2	356.6	7920
4500	7830.1	3485	63.9	123.4	496.5	7626.4	3234	58.1	110.5	420.9	8100
4600	8192.1	3620	69.4	135.7	568.4	7962.3	3359	63.5	122.2	486.7	8280
4700	8567.5	3754	74.8	147.3	641.9	8311.7	3494	68.0	132.8	554.1	8460
4800	8955.5	3880	80.3	159.5	716.5	8674.2	3625	72.9	143.8	623.2	8640
4900	9357.6	4021	86.8	171.8	788.5	9050.3	3761	79.0	155.5	692.0	8820
5000	9776.0	4184	92.6	184.3	861.0	9442.3	3920	84.1	167.5	761.7	9000

Table 1510.04 ENTHALPY (H_T in ft-lb$_F$/slug) for dry and moist air (Concluded)
(See Section 1500.3 for definition of residuals)

1510.05 Entropy

0.01 Atmosphere Pressu							
T (°K)	S_T	Δ	T (°R)	T (°K)	S_T	Δ	T (°R)
50	38219		90	300	48963	205	540
60	39313	1094	108	310	49160	197	558
70	40236	923	126	320	49351	191	576
80	41038	802	144	330	49536	185	594
90	41743	705	162	340	49716	180	612
100	42378	635	180	350	49889	173	630
110	42946	568	198	360	50059	170	648
120	43468	522	216	370	50224	165	666
130	43947	479	234	380	50386	162	684
140	44392	445	252	390	50543	157	702
150	44805	413	270	400	50696	153	720
160	45191	386	288	410	50846	150	738
170	45555	364	306	420	50991	145	756
180	45899	344	324	430	51136	145	774
190	46223	324	342	440	51276	140	792
200	46530	307	360	450	51414	138	810
210	46822	292	378	460	51548	134	828
220	47100	278	396	470	51678	130	846
230	47368	268	414	480	51807	129	864
240	47624	256	432	490	51934	127	882
250	47867	243	450	500	52059	125	900
260	48103	236	468	510	52181	122	918
270	48329	226	486	520	52301	120	936
280	48547	218	504	530	52418	117	954
290	48758	211	522	540	52535	117	972

Moisture residuals at 300°K(540°R)

Mole % moisture content	0.5	1.0	5.0
S_T Residuals	100	230	1150

Conversion Factors for Entropy (S_T)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
S_T with dimensions of ft lb_F $slug^{-1}$ $°R^{-1}$	S_T	$ft^2\ sec^{-2}\ °R^{-1}$	1.00000
		ft lb_F lb_M^{-1} $°R^{-1}$	0.0310810
		ft lb_F $mole_{lb}^{-1}$ $°R^{-1}$	0.900293
		Btu lb_M^{-1} $°R^{-1}$	3.99680×10^{-5}
		Btu $mole_{lb}^{-1}$ $°R^{-1}$	0.0115771

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air
(See Section 1500.3 for definition of residuals)

0.01 Atmosphere Pressure							
T (°K)	S_T	Δ	T (°R)	T (°K)	S_T	Δ	T (°R)
550	52648	113	990	800	55039	82	1440
560	52761	113	1008	850	55441	402	1530
570	52871	110	1026	900	55822	381	1620
580	52979	108	1044	950	56186	364	1710
590	53086	107	1062	1000	56534	348	1800
600	53192	106	1080	1050	56869	335	1890
610	53297	105	1098	1100	57190	321	1980
620	53400	103	1116	1150	57500	310	2070
630	53501	101	1134	1200	57801	301	2160
640	53601	100	1152	1250	58089	288	2250
650	53698	97	1170	1300	58369	280	2340
660	53794	96	1188	1350	58640	271	2430
670	53891	97	1206	1400	58903	263	2520
680	53985	94	1224	1450	59158	255	2610
690	54079	94	1242	1500	59407	249	2700
700	54172	93	1260	1550	59649	242	2790
710	54263	91	1278	1600	59886	237	2880
720	54352	89	1296	1650	60118	232	2970
730	54442	90	1314	1700	60346	228	3060
740	54529	87	1332	1750	60571	225	3150
750	54617	88	1350	1800	60793	222	3240
760	54703	86	1368	1850	61012	219	3330
770	54788	85	1386	1900	61232	220	3420
780	54872	84	1404	1950	61453	221	3510
790	54957	85	1422	2000	61680	227	3600
				2050	61913	233	3690
				2100	62157	244	3780
				2150	62415	258	3870
				2200	62688	273	3960
				2250	62978	290	4050
				2300	63287	309	4140

Conversion Factors for Entropy (S_T)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
S_T with dimensions of ft lb_F $slug^{-1}$ $°R^{-1}$	S_T	cal gm^{-1} $°K^{-1}$	3.99680×10^{-5}
		cal $mole_{gm}^{-1}$ $°K^{-1}$	1.15771×10^{-3}
		joule gm^{-1} $°K^{-1}$	1.67226×10^{-4}
		erg gm^{-1} $°K^{-1}$	1672.26

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
80	37076										144
90	37787	711				35382					162
100	38418	631				36022	640				180
110	38990	572				36597	575				198
120	39513	523				37122	525				216
130	39992	479				37605	483				234
140	40437	445				38051	446				252
150	40851	414				38466	415				270
160	41238	387				38854	388				288
170	41602	364				39218	364				306
180	41944	342				39561	343				324
190	42268	324				39886	325				342
200	42576	308				40193	307				360
210	42869	293				40487	294				378
220	43149	280				40766	279				396
230	43415	266				41032	266				414
240	43671	256				41288	256				432
250	43914	243				41534	246				450
260	44150	236				41769	235				468
270	44376	226				41995	226				486
280	44594	218				42213	218				504
290	44805	211				42425	212				522
300	45010	205	90	210	1070	42629	204	80	200	1020	540
310	45207	197				42826	197				558
320	45397	190				43017	191				576
330	45583	186				43202	185				594
340	45763	180				43382	180				612
350	45938	175				43557	175				630
360	46108	170				43727	170				648
370	46273	165				43892	165				666
380	46434	161				44053	161				684
390	46592	158				44211	158				702
400	46745	153	100	220	1130	44364	153	100	210	1080	720
410	46894	149				44513	149				738
420	47040	146				44659	146				756
430	47183	143				44802	143				774
440	47323	140				44943	141				792
450	47461	138				45080	137				810
460	47595	134				45214	134				828
470	47727	132				45346	132				846
480	47855	128				45475	129				864
490	47982	127				45602	127				882
500	48106	124	100	220	1150	45727	125	90	210	1110	900
510	48228	122				45849	122				918
520	48348	120				45969	120				936
530	48467	119				46086	117				954
540	48582	115				46202	116				972

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air
(Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
90	34385					33761					162
100	35044	659				34414	653				180
110	35624	580				34997	583				198
120	36151	527				35528	531				216
130	36635	484				36013	485				234
140	37083	448				36463	450				252
150	37498	415				36880	417				270
160	37888	390				37270	390				288
170	38253	365				37636	366				306
180	38597	344				37981	345				324
190	38921	324				38307	326				342
200	39230	309				38616	309				360
210	39524	294				38909	293				378
220	39803	279				39189	280				396
230	40070	267				39455	266				414
240	40325	255				39711	256				432
250	40571	246				39956	245				450
260	40808	237				40193	237				468
270	41034	226				40420	227				486
280	41252	218				40638	218				504
290	41463	211				40849	211				522
300	41668	205	90	200	1010	41053	204	90	200	1000	540
310	41865	197				41250	197				558
320	42055	190				41443	193				576
330	42241	186				41628	185				594
340	42421	180				41808	180				612
350	42596	175				41983	175				630
360	42766	170				42153	170				648
370	42931	165				42318	165				666
380	43092	161				42479	161				684
390	43250	158				42637	158				702
400	43403	153	90	210	1060	42790	153	90	210	1050	720
410	43552	149				42939	149				738
420	43698	146				43085	146				756
430	43841	143				43230	145				774
440	43981	140				43370	140				792
450	44119	138				43508	138				810
460	44253	134				43640	132				828
470	44385	132				43772	132				846
480	44513	128				43901	129				864
490	44640	127				44028	127				882
500	44766	126	100	220	1100	44153	125	100	210	1090	900
510	44888	122				44275	122				918
520	45008	120				44395	120				936
530	45125	117				44513	118				954
540	45241	116				44628	115				972

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
550	48695	113				46316	114				990
560	48806	111				46427	111				1008
570	48918	112				46539	112				1026
580	49028	110				46647	108				1044
590	49134	106				46753	106				1062
600	49239	105	70	230	1190	46860	107	70	220	1150	1080
610	49344	105				46965	105				1098
620	49447	103				47066	101				1116
630	49548	101				47167	101				1134
640	49647	99				47267	100				1152
650	49745	98				47365	98				1170
660	49843	98				47462	97				1188
670	49939	96				47559	97				1206
680	50034	95				47653	94				1224
690	50126	92				47747	94				1242
700	50219	93	100	240	1220	47840	93	100	230	1170	1260
710	50310	91				47931	91				1278
720	50401	91				48020	89				1296
730	50490	89				48110	90				1314
740	50578	88				48197	87				1332
750	50665	87				48285	88				1350
760	50751	86				48370	85				1368
770	50837	86				48456	86				1386
780	50921	84				48540	84				1404
790	51003	82				48624	84				1422
800	51086	83	120	250	1250	48707	83	110	240	1200	1440
850	51488	402				49108	401				1530
900	51869	381	120	250	1280	49490	382	110	250	1230	1620
950	52232	363				49853	363				1710
1000	52581	349	120	260	1300	50202	349	110	250	1250	1800
1050	52916	335				50537	335				1890
1100	53238	322	110	260	1310	50859	322	110	250	1270	1980
1150	53549	311				51170	311				2070
1200	53848	299	120	270	1340	51469	299	110	240	1290	2160
1250	54136	288				51757	288				2250
1300	54416	280	130	270	1360	52037	280	120	260	1320	2340
1350	54687	271				52308	271				2430
1400	54950	263	130	260	1380	52571	263	130	270	1340	2520
1450	55205	255				52826	255				2610
1500	55454	249	130	280	1400	53075	249	130	270	1350	2700
1550	55696	242				53317	242				2790
1600	55933	237	130	280	1410	53554	237	130	270	1360	2880
1650	56165	232				53784	230				2970
1700	56392	227	140	290	1450	54009	225	120	280	1380	3060
1750	56613	221				54230	221				3150

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure		S_T Residuals, for mole % moisture content			1.0 Atmosphere Pressure		S_T Residuals, for mole % moisture content			T (°R)
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
550	45355	114				44743	115				990
560	45468	113				44855	117				1008
570	45578	110				44965	110				1026
580	45686	108				45073	108				1044
590	45794	108				45179	106				1062
600	45899	105	70	220	1130	45286	107	80	210	1110	1080
610	46003	104				45391	105				1098
620	46106	103				45494	103				1116
630	46208	102				45595	101				1134
640	46307	99				45694	99				1152
650	46405	98				45792	98				1170
660	46503	98				45890	98				1188
670	46599	96				45986	96				1206
680	46693	94				46081	95				1224
690	46786	93				46173	92				1242
700	46879	93	100	220	1150	46266	93	110	230	1150	1260
710	46970	91				46357	91				1278
720	47061	91				46448	91				1296
730	47150	89				46537	89				1314
740	47238	88				46625	88				1332
750	47325	87				46712	87				1350
760	47411	86				46798	86				1368
770	47497	86				46884	86				1386
780	47581	84				46968	84				1404
790	47665	84				47052	84				1422
800	47747	82	110	240	1180	47135	83	100	230	1170	1440
850	48147	400				47534	399				1530
900	48528	381	110	250	1210	47916	382	110	240	1200	1620
950	48892	364				48279	363				1710
1000	49241	349	110	250	1230	48628	349	110	240	1220	1800
1050	49575	334				48963	335				1890
1100	49898	323	120	250	1260	49285	322	120	250	1250	1980
1150	50209	311				49596	311				2070
1200	50507	298	110	250	1280	49895	299	110	250	1260	2160
1250	50796	289				50183	288				2250
1300	51076	280	120	260	1300	50463	280	120	250	1280	2340
1350	51347	271				50734	271				2430
1400	51609	262	130	270	1320	50998	264	120	270	1310	2520
1450	51865	256				51254	256				2610
1500	52114	249	120	270	1330	51503	249	120	260	1320	2700
1550	52356	242				51745	242				2790
1600	52593	237	120	260	1350	51982	237	120	260	1330	2880
1650	52823	230				52212	230				2970
1700	53048	225	120	270	1360	52437	225	130	280	1360	3060
1750	53269	221				52658	221				3150

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
1800	56831	218	140	300	1470	54447	217	120	280	1410	3240
1850	57045	214				54660	213				3330
1900	57257	212	150	310	1500	54869	209	140	290	1440	3420
1950	57466	209				55075	206				3510
2000	57674	208	150	320	1520	55278	203	140	290	1460	3600
2050	57881	207				55478	200				3690
2100	58089	208	160	330	1570	55677	199	150	310	1500	3780
2150	58299	210				55877	200				3870
2200	58511	212	170	350	1630	56076	199	160	330	1550	3960
2250	58728	217				56275	199				4050
2300	58951	223	190	370	1700	56476	201	170	350	1600	4140
2350	59183	232				56680	204				4230
2400	59423	240	200	400	1800	56888	208	180	350	1650	4320
2450	59675	252				57100	212				4410
2500	59943	268	230	450	1920	57318	218	200	390	1730	4500
2550	60224	281				57543	225				4590
2600	60525	301	260	490	2100	57775	232	210	410	1820	4680
2650	60846	321				58015	240				4770
2700	61187	341	300	560	2300	58266	251	240	460	1950	4860
2750	61553	366				58371	105				4950
2800	61941	388	310	600	2550	58795	424	270	500	2110	5040
2850											5130
2900	62830	889	330	660	2850	59470	675	280	540	2280	5220
2950											5310
3000	63760	930	360	720	3190	60150	680	300	580	2490	5400
3100						60880	730	310	620	2720	5580
3200						61670	790	330	660	2970	5760
3300						62500	830	350	710	3240	5940
3400						63360	860	370	750	3480	6120
3500						64220	860	390	790	3710	6300
3600						65080	860	410	810	3900	6480
3700						65900	820	420	850	4080	6660
3800						66700	800	440	880	4230	6840
3900						67490	790	440	890	4350	7020
4000						68290	800	450	910	4440	7200
4100						69110	620	460	930	4520	7380
4200						70000	890	450	920	4560	7560
4300						70950	950	470	940	4620	7740
4400						72000	1050	470	960	4670	7920
4500						73180	1180	460	950	4700	8100
4600						74450	1270	470	960	4720	8280
4700						75840	1390	490	970	4740	8460
4800						77330	1490	490	970	4760	8640
4900						78920	1590	490	980	4760	8820
5000						80570	1650	480	960	4740	9000

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
1800	53486	217	120	270	1380	52874	216	130	270	1380	3240
1850	53698	212				53086	212				3330
1900	53906	208	130	280	1410	53293	207	140	280	1410	3420
1950	54110	204				53498	205				3510
2000	54311	201	150	290	1440	53698	200	140	280	1430	3600
2050	54510	199				53897	199				3690
2100	54708	198	140	300	1470	54093	196	140	300	1460	3780
2150	54903	195				54287	194				3870
2200	55099	196	150	320	1510	54481	194	150	310	1490	3960
2250	55293	194				54673	192				4050
2300	55489	196	160	340	1560	54866	193	160	330	1530	4140
2350	55686	197				55060	194				4230
2400	55885	199	180	340	1610	55255	195	170	340	1580	4320
2450	56088	203				55453	198				4410
2500	56294	206	190	370	1680	55653	200	180	360	1640	4500
2550	56505	211				55858	205				4590
2600	56721	216	200	400	1760	56065	207	190	380	1710	4680
2650	56943	222				56280	215				4770
2700	57171	228	230	430	1860	56501	221	220	420	1800	4860
2750	57406	235				56730	229				4950
2800	57648	242	230	460	1970	56967	237	220	450	1920	5040
2850						57212	245				5130
2900	58260	612	260	500	2130	57469	257	260	480	2050	5220
2950						57737	268				5310
3000	58850	590	280	540	2300	58015	278	270	510	2190	5400
3100	59490	640	300	580	2490	58650	635	280	560	2360	5580
3200	60190	700	310	620	2700	59290	640	300	600	2550	5760
3300	60930	740	330	660	2940	59980	690	320	630	2760	5940
3400	61710	780	350	700	3160	60710	730	330	670	2970	6120
3500	62510	800	370	730	3380	61460	750	350	690	3180	6300
3600	63320	810	380	760	3580	62230	770	360	730	3380	6480
3700	64110	790	400	800	3780	63000	770	380	750	3580	6660
3800	64890	780	410	820	3950	63760	760	390	780	3750	6840
3900	65660	770	410	830	4080	64510	750	400	800	3900	7020
4000	66420	760	420	860	4200	65250	740	410	830	4040	7200
4100	67180	760	440	890	4300	65990	740	420	850	4140	7380
4200	67980	800	430	890	4370	66740	750	430	870	4240	7560
4300	68810	830	450	910	4440	67520	780	440	890	4320	7740
4400	69710	900	450	920	4500	68350	830	440	900	4380	7920
4500	70690	980	460	920	4550	69230	880	460	910	4450	8100
4600	71750	1060	460	940	4580	70190	960	450	920	4480	8280
4700	72910	1160	470	940	4610	71220	1030	460	930	4520	8460
4800	74170	1260	470	940	4630	72350	1130	460	920	4550	8640
4900	75510	1340	480	970	4660	73550	1200	470	940	4580	8820
5000	76950	1440	470	940	4650	74850	1300	460	930	4580	9000

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
90	33761										162
100	34414	653									180
110	34997	583				32447					198
120	35528	531				33020	573				216
130	36013	485				33535	515				234
140	36463	450				34003	468				252
150	36880	417				34436	433				270
160	37270	390				34836	400				288
170	37636	366				35207	371				306
180	37981	345				35557	350				324
190	38307	326				35888	331				342
200	38616	309				36202	314				360
210	38909	293				36499	297				378
220	39189	280				36782	283				396
230	39455	266				37052	270				414
240	39711	256				37311	259				432
250	39956	245				37558	247				450
260	40193	237				37795	237				468
270	40420	227				38023	228				486
280	40638	218				38245	222				504
290	40849	211				38458	213				522
300	41053	204	90	200	1000	38662	204	100	200	970	540
310	41250	197				38859	197				558
320	41443	193				39052	193				576
330	41628	185				39239	187				594
340	41808	180				39419	180				612
350	41983	175				39594	175				630
360	42153	170				39764	170				648
370	42318	165				39930	166				666
380	42479	161				40092	162				684
390	42637	158				40250	158				702
400	42790	153	90	210	1050	40404	154	90	200	1010	720
410	42939	149				40555	151				738
420	43085	146				40701	146				756
430	43230	145				40844	143				774
440	43370	140				40984	140				792
450	43508	138				41122	138				810
460	43640	132				41256	134				828
470	43772	132				41388	132				846
480	43901	129				41518	130				864
490	44028	127				41645	127				882
500	44153	125	100	210	1090	41771	126	100	210	1050	900
510	44275	122				41892	121				918
520	44395	120				42011	119				936
530	44513	118				42129	118				954
540	44628	115				42246	117				972

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air
(Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
110	31334					30529					198
120	31944	610				31192	663				216
130	32483	539				31763	571				234
140	32967	484				32272	509				252
150	33411	444				32732	460				270
160	33822	411				33152	420				288
170	34203	381				33542	390				306
180	34560	357				33906	364				324
190	34894	334				34247	341				342
200	35210	316				34568	321				360
210	35511	301				34872	304				378
220	35795	284				35160	288				396
230	36067	272				35435	275				414
240	36326	259				35698	263				432
250	36575	249				35950	252				450
260	36815	240				36190	240				468
270	37047	232				36422	232				486
280	37270	223				36643	221				504
290	37484	214				36858	215				522
300	37690	206	110	210	960	37066	208	120	220	960	540
310	37890	200				37265	199				558
320	38082	192				37459	194				576
330	38269	187				37646	187				594
340	38449	180				37828	182				612
350	38624	175				38005	177				630
360	38796	172				38176	171				648
370	38962	166				38343	167				666
380	39125	163				38506	163				684
390	39283	158				38665	159				702
400	39438	155	100	200	990	38820	155	100	200	980	720
410	39587	149				38969	149				738
420	39735	148				39117	148				756
430	39879	144				39261	144				774
440	40020	141				39402	141				792
450	40157	137				39541	139				810
460	40291	134				39675	134				828
470	40423	132				39807	132				846
480	40554	131				39937	130				864
490	40681	127				40064	127				882
500	40806	125	90	200	1020	40190	126	90	200	1010	900
510	40928	122				40312	122				918
520	41048	120				40432	120				936
530	41165	117				40550	118				954
540	41281	116				40667	117				972

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
550	44743	115				42361	115				990
560	44855	112				42473	112				1008
570	44965	110				42582	109				1026
580	45073	108				42691	109				1044
590	45179	106				42797	106				1062
600	45286	107	80	210	1110	42903	106	100	220	1080	1080
610	45391	105				43008	105				1098
620	45494	103				43111	103				1116
630	45595	101				43212	101				1134
640	45694	99				43312	100				1152
650	45792	98				43410	98				1170
660	45890	98				43508	98				1188
670	45986	96				43604	96				1206
680	46081	95				43698	94				1224
690	46173	92				43793	95				1242
700	46266	93	110	230	1150	43885	92	100	220	1100	1260
710	46357	91				43976	91				1278
720	46448	91				44067	91				1296
730	46537	89				44156	89				1314
740	46625	88				44244	88				1332
750	46712	87				44332	88				1350
760	46798	86				44417	85				1368
770	46884	86				44503	86				1386
780	46968	84				44587	84				1404
790	47052	84				44671	84				1422
800	47135	83	100	230	1170	44754	83	100	220	1120	1440
850	47534	399				45154	400				1530
900	47916	382	110	240	1200	45535	381	110	230	1160	1620
950	48279	363				45900	365				1710
1000	48628	349	110	240	1220	46249	349	110	240	1180	1800
1050	48963	335				46584	335				1890
1100	49285	322	120	250	1250	46906	322	110	240	1200	1980
1150	49596	311				47217	311				2070
1200	49895	299	110	250	1260	47516	299	110	240	1220	2160
1250	50183	288				47804	288				2250
1300	50463	280	120	250	1280	48084	280	120	250	1230	2340
1350	50734	271				48355	271				2430
1400	50998	264	120	270	1310	48618	263	120	250	1260	2520
1450	51254	256				48873	255				2610
1500	51503	249	120	260	1320	49122	249	120	250	1270	2700
1550	51745	242				49364	242				2790
1600	51982	237	120	260	1330	49601	237	120	250	1290	2880
1650	52212	230				49831	230				2970
1700	52437	225	130	280	1360	50056	225	130	260	1310	3060
1750	52658	221				50276	220				3150

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure		S_T Residuals, for mole % moisture content			10.0 Atmospheres Pressure		S_T Residuals, for mole % moisture content			T (°R)
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
550	41396	115				40782	115				990
560	41510	114				40895	113				1008
570	41619	109				41005	110				1026
580	41728	109				41113	108				1044
590	41834	106				41221	108				1062
600	41940	106	100	210	1060	41328	107	100	210	1050	1080
610	42045	105				41432	104				1098
620	42148	103				41535	103				1116
630	42249	101				41637	102				1134
640	42349	100				41736	99				1152
650	42449	100				41834	98				1170
660	42546	97				41932	98				1188
670	42643	97				42028	96				1206
680	42737	94				42122	94				1224
690	42830	93				42217	95				1242
700	42922	92	100	210	1080	42310	93	100	220	1070	1260
710	43013	91				42400	90				1278
720	43104	91				42491	91				1296
730	43194	90				42581	90				1314
740	43281	87				42668	87				1332
750	43369	88				42756	88				1350
760	43454	85				42842	86				1368
770	43540	86				42927	85				1386
780	43624	84				43012	85				1404
790	43708	84				43096	84				1422
800	43791	83	100	220	1100	43178	82	100	220	1100	1440
850	44192	401				43578	400				1530
900	44574	382	110	220	1140	43959	381	100	220	1120	1620
950	44939	365				44323	364				1710
1000	45288	349	110	230	1160	44671	348	100	230	1150	1800
1050	45622	334				45008	337				1890
1100	45945	323	110	240	1180	45329	321	100	230	1170	1980
1150	46254	309				45638	309				2070
1200	46554	300	110	240	1200	45938	300	110	250	1190	2160
1250	46843	289				46227	289				2250
1300	47123	280	110	240	1210	46505	278	120	250	1210	2340
1350	47394	271				46776	271				2430
1400	47656	262	120	250	1240	47038	262	110	240	1230	2520
1450	47912	256				47294	256				2610
1500	48161	249	120	250	1250	47543	249	110	240	1240	2700
1550	48403	242				47785	242				2790
1600	48640	237	120	260	1280	48022	237	120	260	1270	2880
1650	48870	230				48252	230				2970
1700	49095	225	130	260	1290	48477	225	120	250	1280	3060
1750	49314	219				48697	220				3150

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
1800	52874	216	130	270	1380	50492	216	120	270	1330	3240
1850	53086	212				50703	211				3330
1900	53293	207	140	280	1410	50911	208	130	270	1350	3420
1950	53498	205				51115	204				3510
2000	53698	200	140	280	1430	51316	201	130	280	1380	3600
2050	53897	199				51513	197				3690
2100	54093	196	140	300	1460	51707	194	140	290	1400	3780
2150	54287	194				51899	192				3870
2200	54481	194	150	310	1490	52088	189	140	300	1430	3960
2250	54673	192				52275	187				4050
2300	54866	193	160	330	1530	52461	186	150	300	1460	4140
2350	55060	194				52646	185				4230
2400	55255	195	170	340	1580	52830	184	160	330	1500	4320
2450	55453	198				53013	183				4410
2500	55653	200	180	360	1640	53197	184	160	330	1530	4500
2550	55858	205				53383	186				4590
2600	56065	207	190	380	1710	53568	185	170	350	1580	4680
2650	56280	215				53755	187				4770
2700	56501	221	220	420	1800	53946	191	180	360	1640	4860
2750	56730	229				54138	192				4950
2800	56967	237	220	450	1920	54333	195	190	390	1710	5040
2850	57212	245				54533	200				5130
2900	57469	257	260	480	2050	54737	204	220	410	1810	5220
2950	57737	268				54946	209				5310
3000	58015	278	270	510	2190	55161	215	230	430	1890	5400
3100	58650	635	280	560	2360	55650	489	250	470	1990	5580
3200	59290	640	300	600	2550	56130	480	260	500	2110	5760
3300	59980	690	320	630	2760	56640	510	270	520	2240	5940
3400	60710	730	330	670	2970	57180	540	280	550	2380	6120
3500	61460	750	350	690	3180	57750	570	290	580	2530	6300
3600	62230	770	360	730	3380	58340	590	310	610	2690	6480
3700	63000	770	380	750	3580	58970	630	320	630	2860	6660
3800	63760	760	390	780	3750	59610	640	320	650	3010	6840
3900	64510	750	400	800	3900	60250	640	340	690	3180	7020
4000	65250	740	410	830	4040	60910	660	340	700	3330	7200
4100	65990	740	420	850	4140	61560	650	360	730	3460	7380
4200	66740	750	430	870	4240	62210	650	380	750	3600	7560
4300	67520	780	440	890	4320	62860	650	380	780	3710	7740
4400	68350	830	440	900	4380	63510	650	390	800	3820	7920
4500	69230	880	460	910	4450	64180	670	400	810	3910	8100
4600	70190	960	450	920	4480	64870	690	400	810	3990	8280
4700	71220	1030	460	930	4520	65580	710	410	830	4060	8460
4800	72350	1130	460	920	4550	66330	750	420	840	4120	8640
4900	73550	1200	470	940	4580	67120	790	420	850	4170	8820
5000	74850	1300	460	930	4580	67960	840	420	870	4210	9000

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
1800	49531	217	120	260	1320	48913	216	130	270	1310	3240
1850	49742	211				49124	211				3330
1900	49950	208	130	280	1340	49332	208	130	270	1330	3420
1950	50154	204				49534	202				3510
2000	50353	199	130	270	1350	49733	199	120	270	1340	3600
2050	50550	197				49929	196				3690
2100	50744	194	130	280	1380	50123	194	140	280	1370	3780
2150	50935	191				50313	190				3870
2200	51124	189	140	290	1400	50501	188	140	290	1390	3960
2250	51309	185				50686	185				4050
2300	51493	184	150	290	1440	50870	184	150	290	1420	4140
2350	51676	183				51052	182				4230
2400	51858	182	150	310	1470	51232	180	150	310	1450	4320
2450	52039	181				51410	178				4410
2500	52219	180	150	310	1500	51589	179	140	310	1470	4500
2550	52399	180				51767	178				4590
2600	52579	180	160	330	1540	51946	179	170	330	1520	4680
2650	52761	182				52124	178				4770
2700	52943	182	180	360	1600	52303	179	170	340	1570	4860
2750	53127	184				52483	180				4950
2800	53312	185	190	380	1660	52663	180	180	360	1620	5040
2850	53499	187				52845	182				5130
2900	53690	191	190	380	1720	53031	186	190	370	1680	5220
2950	53884	194				53218	187				5310
3000	54081	197	220	410	1800	53407	189	200	400	1750	5400
3100	54540	459	220	430	1880	53850	443	210	420	1820	5580
3200	54970	430	240	470	1990	54250	400	240	450	1920	5760
3300	55420	450	260	490	2100	54680	430	240	470	2010	5940
3400	55900	480	260	520	2210	55130	450	250	490	2120	6120
3500	56410	510	280	540	2340	55600	470	260	520	2230	6300
3600	56940	530	280	560	2470	56090	490	280	540	2350	6480
3700	57500	560	300	590	2610	56610	520	290	560	2470	6660
3800	58070	570	300	610	2760	57140	530	290	590	2610	6840
3900	58660	590	320	640	2910	57690	550	310	620	2750	7020
4000	59270	610	320	660	3050	58260	570	320	630	2890	7200
4100	59870	600	340	680	3190	58830	570	330	660	3020	7380
4200	60480	610	360	700	3320	59420	590	330	670	3140	7560
4300	61090	610	360	720	3440	60000	580	340	690	3260	7740
4400	61700	610	370	740	3550	60580	580	350	710	3380	7920
4500	62320	620	370	760	3650	61170	590	360	730	3490	8100
4600	62940	620	390	780	3750	61760	590	380	750	3590	8280
4700	63580	640	390	790	3830	62370	610	380	760	3670	8460
4800	64240	660	400	810	3900	62980	610	390	780	3750	8640
4900	64930	690	400	810	3960	63620	640	390	790	3820	8820
5000	65650	720	410	830	4020	64290	670	390	800	3870	9000

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
110	30529										198
120	31192	663									216
130	31763	571									234
140	32272	509									252
150	32732	460									270
160	33152	420				29995					288
170	33542	390				30605	610				306
180	33906	364				31039	434				324
190	34247	341				31461	422				342
200	34568	321				31842	381				360
210	34872	304				32193	351				378
220	35160	288				32520	327				396
230	35435	275				32824	304				414
240	35698	263				33111	287				432
250	35950	252				33384	273				450
260	36190	240				33643	259				468
270	36422	232				33888	245				486
280	36643	221				34124	236				504
290	36858	215				34352	228				522
300	37066	208	120	220	960	34566	214				540
310	37265	199				34778	212				558
320	37459	194				34980	202				576
330	37646	187				35174	194				594
340	37828	182				35363	189				612
350	38005	177				35543	180				630
360	38176	171				35720	177				648
370	38343	167				35893	173				666
380	38506	163				36060	167				684
390	38665	159				36223	163				702
400	38820	155	100	200	980	36379	156				720
410	38969	149				36534	155				738
420	39117	148				36685	151				756
430	39261	144				36832	147				774
440	39402	141				36975	143				792
450	39541	139				37115	140				810
460	39675	134				37253	138				828
470	39807	132				37387	134				846
480	39937	130				37517	130				864
490	40064	127				37646	129				882
500	40190	126	90	200	1010	37773	127	130	230	1000	900
510	40312	122				37898	125				918
520	40432	120				38020	122				936
530	40550	118				38140	120				954
540	40667	117				38259	119				972

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure		S_T Residuals, for mole % moisture content			100.0 Atmospheres Pressure		S_T Residuals, for mole % moisture content			T (°R)
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
180	29462					28221					324
190	30025	563				28942	721				342
200	30497	472				29496	554				360
210	30912	415				29989	493				378
220	31286	374				30413	424				396
230	31628	342				30790	377				414
240	31944	316				31134	344				432
250	32239	295				31453	319				450
260	32519	280				31748	295				468
270	32781	262				32026	278				486
280	33029	248				32290	264				504
290	33269	240				32544	254				522
300	33494	225				32776	232				540
310	33713	219				33004	228				558
320	33925	212				33224	220				576
330	34127	202				33434	210				594
340	34319	192				33631	197				612
350	34505	186				33822	191				630
360	34688	183				34009	187				648
370	34865	177				34189	180				666
380	35037	172				34366	177				684
390	35202	165				34534	168				702
400	35363	161				34697	163				720
410	35521	158				34858	161				738
420	35674	153				35014	156				756
430	35823	149				35166	152				774
440	35969	146				35315	149				792
450	36111	142				35459	144				810
460	36250	139				35603	144				828
470	36388	138				35742	139				846
480	36522	134				35878	136				864
490	36652	130				36012	134				882
500	36781	129				36142	130				900
510	36906	125				36269	127				918
520	37030	124				36393	124				936
530	37150	120				36513	120				954
540	37268	118				36631	118				972

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
550	40782	115				38374	115				990
560	40895	113				38487	113				1008
570	41005	110				38598	111				1026
580	41113	108				38708	110				1044
590	41221	108				38816	108				1062
600	41328	107	100	210	1050	38925	109	110	220	1030	1080
610	41432	104				39029	104				1098
620	41535	103				39132	103				1116
630	41637	102				39235	103				1134
640	41736	99				39337	102				1152
650	41834	98				39436	99				1170
660	41932	98				39534	98				1188
670	42028	96				39630	96				1206
680	42122	94				39726	96				1224
690	42217	95				39821	95				1242
700	42310	93	100	220	1070	39913	92	110	230	1050	1260
710	42400	90				40006	93				1278
720	42491	91				40097	91				1296
730	42581	90				40186	89				1314
740	42668	87				40275	89				1332
750	42756	88				40363	88				1350
760	42842	86				40451	88				1368
770	42927	85				40536	85				1386
780	43012	85				40620	84				1404
790	43096	84				40705	85				1422
800	43178	82	100	220	1100	40787	82	110	230	1070	1440
850	43578	400				41189	402				1530
900	43959	381	100	220	1120	41571	382	110	230	1090	1620
950	44323	364				41935	364				1710
1000	44671	348	100	230	1150	42284	349	110	230	1110	1800
1050	45008	337				42620	336				1890
1100	45329	321	100	230	1170	42943	323	110	230	1140	1980
1150	45638	309				43252	309				2070
1200	45938	300	110	250	1190	43552	300	100	220	1140	2160
1250	46227	289				43839	287				2250
1300	46505	278	120	250	1210	44117	278	110	230	1170	2340
1350	46776	271				44388	271				2430
1400	47038	262	110	240	1230	44651	263	110	240	1190	2520
1450	47294	256				44907	256				2610
1500	47543	249	110	240	1240	45154	247	110	240	1200	2700
1550	47785	242				45396	242				2790
1600	48022	237	120	260	1270	45633	237	110	250	1220	2880
1650	48252	230				45863	230				2970
1700	48477	225	120	250	1280	46087	224	110	250	1230	3060
1750	48697	220				46307	220				3150

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure		S_T Residuals, for mole % moisture content			100.0 Atmospheres Pressure		S_T Residuals, for mole % moisture content			T (°R)
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
550	37385	117				36748	117				990
560	37500	115				36863	115				1008
570	37613	113				36976	113				1026
580	37725	112				37090	114				1044
590	37835	110				37201	111				1062
600	37941	106				37309	108				1080
610	38047	106				37416	107				1098
620	38152	105				37521	105				1116
630	38255	103				37624	103				1134
640	38356	101				37727	103				1152
650	38456	100				37828	101				1170
660	38556	100				37927	99				1188
670	38653	97				38025	98				1206
680	38750	97				38121	96				1224
690	38844	94				38217	96				1242
700	38938	94				38312	95				1260
710	39031	93				38405	93				1278
720	39122	91				38495	90				1296
730	39211	89				38586	91				1314
740	39301	90				38676	90				1332
750	39388	87				38765	89				1350
760	39476	88				38853	88				1368
770	39561	85				38938	85				1386
780	39647	86				39024	86				1404
790	39731	84				39108	84				1422
800	39815	84	120	240	1060	39192	84				1440
850	40221	406				39597	405				1530
900	40603	382	110	230	1080	39982	385				1620
950	40967	364				40346	364				1710
1000	41317	350	110	230	1100	40696	350				1800
1050	41654	337				41032	336				1890
1100	41975	321	110	230	1120	41355	323	120	240	1120	1980
1150	42285	310				41666	311				2070
1200	42584	299	100	220	1130	41965	299	120	230	1130	2160
1250	42871	287				42251	286				2250
1300	43149	278	110	230	1150	42529	278	110	230	1150	2340
1350	43420	271				42800	271				2430
1400	43681	261	110	250	1170	43061	261	120	250	1170	2520
1450	43937	256				43317	256				2610
1500	44184	247	110	240	1190	43564	247	110	240	1180	2700
1550	44426	242				43806	242				2790
1600	44663	237	110	250	1200	44043	237	120	250	1200	2880
1650	44895	232				44275	232				2970
1700	45121	226	110	250	1220	44501	226	120	250	1210	3060
1750	45343	222				44723	222				3150

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
1800	48913	216	130	270	1310	46523	216	120	260	1260	3240
1850	49124	211				46735	212				3330
1900	49332	208	130	270	1330	46942	207	130	260	1280	3420
1950	49534	202				47145	203				3510
2000	49733	199	120	270	1340	47344	199	130	260	1290	3600
2050	49929	196				47540	196				3690
2100	50123	194	140	280	1370	47732	192	130	270	1310	3780
2150	50313	190				47921	189				3870
2200	50501	188	140	290	1390	48108	187	130	270	1330	3960
2250	50686	185				48291	183				4050
2300	50870	184	150	290	1420	48473	182	130	280	1360	4140
2350	51052	132				48652	179				4230
2400	51232	180	150	310	1450	48829	177	140	290	1380	4320
2450	51410	178				49004	175				4410
2500	51589	179	140	310	1470	49177	173	130	290	1410	4500
2550	51767	178				49349	172				4590
2600	51946	179	170	330	1520	49519	170	150	310	1440	4680
2650	52124	178				49689	170				4770
2700	52303	179	170	340	1570	49857	168	160	310	1480	4860
2750	52483	180				50025	168				4950
2800	52663	180	180	360	1620	50193	168	160	330	1510	5040
2850	52845	182				50362	169				5130
2900	53031	186	190	370	1680	50530	168	170	350	1560	5220
2950	53218	187				50698	168				5310
3000	53407	189	200	400	1750	50866	168	180	360	1610	5400
3100	53850	443	210	420	1820	51260	394	190	370	1650	5580
3200	54250	400	240	450	1920	51600	340	210	400	1720	5760
3300	54680	430	240	470	2010	51960	360	210	410	1770	5940
3400	55130	450	250	490	2120	52320	360	220	430	1840	6120
3500	55600	470	260	520	2230	52690	370	230	450	1920	6300
3600	56090	490	280	540	2350	53070	380	240	460	1990	6480
3700	56610	520	290	560	2470	53460	390	250	490	2080	6660
3800	57140	530	290	590	2610	53860	400	260	510	2170	6840
3900	57690	550	310	620	2750	54280	420	260	510	2250	7020
4000	58260	570	320	630	2890	54710	430	270	540	2350	7200
4100	58830	570	330	660	3020	55150	440	280	550	2440	7380
4200	59420	590	330	670	3140	55610	460	280	560	2530	7560
4300	60000	580	340	690	3260	56070	460	290	580	2650	7740
4400	60580	580	350	710	3380	56550	480	290	600	2740	7920
4500	61170	590	360	730	3490	57030	480	310	620	2850	8100
4600	61760	590	380	750	3590	57520	490	320	640	2940	8280
4700	62370	610	380	760	3670	58020	500	320	640	3040	8460
4800	62980	610	390	780	3750	58520	500	320	660	3120	8640
4900	63620	640	390	790	3820	59020	500	330	680	3210	8820
5000	64290	670	390	800	3870	59540	520	340	690	3280	9000

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			S_T Residuals, for mole % moisture content					S_T Residuals, for mole % moisture content			
	S_T	Δ	0.1	1.0	5.0	S_T	Δ	0.1	1.0	5.0	
1800	45559	216	110	250	1230	44939	216	120	250	1220	3240
1850	45770	211				45150	211				3330
1900	45976	206	120	250	1260	45356	206	130	250	1250	3420
1950	46178	202				45559	203				3510
2000	46378	200	130	250	1270	45758	199	130	250	1260	3600
2050	46573	195				45954	196				3690
2100	46765	192	120	260	1290	46146	192	120	250	1270	3780
2150	46954	189				46335	189				3870
2200	47140	186	130	270	1320	46520	185	130	270	1300	3960
2250	47323	183				46704	184				4050
2300	47505	182	120	270	1320	46884	180	120	280	1310	4140
2350	47684	179				47062	178				4230
2400	47861	177	150	280	1360	47238	176	140	270	1340	4320
2450	48034	173				47411	173				4410
2500	48206	172	130	290	1380	47583	172	130	290	1370	4500
2550	48376	170				47752	169				4590
2600	48544	168	150	300	1410	47921	169	140	300	1390	4680
2650	48712	168				48087	166				4770
2700	48878	166	150	310	1440	48252	165	150	300	1420	4860
2750	49045	167				48417	165				4950
2800	49210	165	160	320	1480	48580	163	150	310	1450	5040
2850	49375	165				48743	163				5130
2900	49539	164	170	340	1520	48904	161	170	330	1500	5220
2950	49704	165				49066	162				5310
3000	49867	163	170	350	1560	49225	159	180	350	1530	5400
3100	50250	383	180	350	1590	49600	375	180	350	1570	5580
3200	50570	320	200	380	1660	49920	320	190	370	1620	5760
3300	50900	330	210	400	1710	50240	320	200	390	1670	5940
3400	51240	340	220	410	1770	50570	330	210	400	1720	6120
3500	51590	350	220	420	1820	50900	330	220	410	1780	6300
3600	51940	350	230	440	1890	51240	340	220	430	1830	6480
3700	52300	360	230	460	1970	51590	350	220	440	1910	6660
3800	52670	370	240	480	2040	51940	350	230	460	1970	6840
3900	53050	380	250	480	2110	52300	360	240	470	2040	7020
4000	53440	390	250	500	2190	52670	370	240	480	2100	7200
4100	53830	390	270	520	2280	53040	370	260	500	2180	7380
4200	54240	410	270	540	2360	53420	380	260	520	2270	7560
4300	54660	420	270	540	2440	53810	390	270	520	2340	7740
4400	55090	430	280	560	2530	54210	400	270	540	2410	7920
4500	55520	430	290	580	2630	54610	400	290	550	2500	8100
4600	55960	440	300	600	2710	55020	410	280	570	2570	8280
4700	56410	450	310	600	2800	55430	410	300	580	2660	8460
4800	56870	460	300	610	2880	55860	430	300	600	2740	8640
4900	57330	460	310	630	2960	56290	430	310	610	2810	8820
5000	57800	470	320	650	3040	56730	440	310	620	2890	9000

Table 1510.05 ENTROPY (S_T in ft-lb_F/slug °R) for dry and moist air (Concluded) (See Section 1500.3 for definition of residuals)

1510.06 Specific Heat at Constant Volume

0.01 Atmosphere Pressure							
T (°K)	c_v	Δ	T (°R)	T (°K)	c_v	Δ	T (°R)
50	4276.7		90	300	4291.9	25	540
60	4276.8	1	108	310	4295.2	33	558
70	4276.8	0	126	320	4298.9	37	576
80	4276.8	0	144	330	4302.7	38	594
90	4276.8	0	162	340	4307.0	43	612
100	4276.8	0	180	350	4312.0	50	630
110	4276.8	0	198	360	4317.3	53	648
120	4276.7	1	216	370	4323.3	60	666
130	4276.6	1	234	380	4329.8	65	684
140	4276.6	0	252	390	4336.4	66	702
150	4276.9	3	270	400	4343.5	71	720
160	4276.9	0	288	410	4351.1	76	738
170	4276.9	0	306	420	4359.5	84	756
180	4277.0	1	324	430	4367.8	83	774
190	4277.4	4	342	440	4376.9	91	792
200	4277.8	4	360	450	4386.5	96	810
210	4278.0	2	378	460	4396.5	100	828
220	4278.7	7	396	470	4406.8	103	846
230	4279.6	9	414	480	4417.3	105	864
240	4280.2	6	432	490	4428.4	111	882
250	4281.8	16	450	500	4439.8	114	900
260	4283.1	13	468	510	4451.4	116	918
270	4284.9	18	486	520	4463.2	118	936
280	4287.1	22	504	530	4475.7	125	954
290	4289.4	23	522	540	4488.5	128	972

Conversion Factors for Specific Heat at Constant Volume (c_v)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
c_v	c_v	$ft^2\ sec^{-2}\ °R^{-1}$	1.00000
with dimensions of $ft\ lb_F\ slug^{-1}\ °R^{-1}$		$ft\ lb_F\ lb_M^{-1}\ °R^{-1}$	0.0310810
		$ft\ lb_F\ mole_{lb}^{-1}\ °R^{-1}$	0.900293
		$Btu\ lb_m^{-1}\ °R^{-1}$	3.99680×10^{-5}
		$Btu\ mole_{lb}^{-1}\ °R^{-1}$	0.0115771

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in $ft\text{-}lb_F/slug\ °R$) for dry and moist air
(See Section 1500.3 for definition of residuals)

0.01 Atmosphere Pressure							
T (°K)	c_v	Δ	T (°R)	T (°K)	c_v	Δ	T (°R)
550	4501.4	129	990	800	4853.2	138	1440
560	4514.4	130	1008	850	4921	68	1530
570	4527.6	132	1026	900	4987	66	1620
580	4541.1	135	1044	950	5052	65	1710
590	4554.6	135	1062	1000	5112	60	1800
600	4568.5	139	1080	1050	5171	59	1890
610	4582.3	138	1098	1100	5226	55	1980
620	4596.5	142	1116	1150	5283	57	2070
630	4610.4	139	1134	1200	5335	52	2160
640	4624.6	142	1152	1250	5387	52	2250
650	4639.1	145	1170	1300	5440	53	2340
660	4653.4	143	1188	1350	5492	52	2430
670	4668.0	146	1206	1400	5545	53	2520
680	4682.4	144	1224	1450	5601	56	2610
690	4696.7	143	1242	1500	5662	61	2700
700	4711.4	147	1260	1550	5725	63	2790
710	4725.7	143	1278	1600	5792	67	2880
720	4740.0	143	1296	1650	5872	80	2970
730	4754.4	144	1314	1700	5960	88	3060
740	4768.9	145	1332	1750	6072	112	3150
750	4782.9	140	1350	1800	6212	140	3240
760	4797.1	142	1368	1850	6395	183	3330
770	4811.2	141	1386	1900	6627	232	3420
780	4825.4	142	1404	1950	6943	316	3510
790	4839.4	140	1422	2000	7355	412	3600
				2050	7893	538	3690
				2100	8577	683	3780

Conversion Factors for Specific Heat at Constant Volume (c_v)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
c_v with dimensions of ft lb_F $slug^{-1}$ $°R^{-1}$	c_v	cal gm^{-1} $°K^{-1}$	3.99680×10^{-5}
		cal $mole_{gm}^{-1}$ $°K^{-1}$	1.15771×10^{-3}
		joule gm^{-1} $°K^{-1}$	1.67226×10^{-4}
		erg gm^{-1} $°K^{-1}$	1672.26

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
	c_v	Δ	c_v Residuals, for mole % moisture content 0.1	1.0	5.0	c_v	Δ	c_v Residuals, for mole % moisture content 0.1	1.0	5.0	
90	4280.8					4297.3					162
100	4279.3	- 15				4290.3	- 70				180
110	4278.9	- 4				4286.5	- 38				198
120	4278.1	- 8				4283.8	- 27				216
130	4277.8	- 3				4281.9	- 19				234
140	4277.5	- 3				4280.6	- 13				252
150	4277.6	1				4279.9	- 7				270
160	4277.4	- 2				4279.3	- 6				288
170	4277.4	0				4279.0	- 3				306
180	4277.4	0				4278.9	- 1				324
190	4277.7	3				4278.9	0				342
200	4278.0	3				4279.3	4				360
210	4278.5	5				4279.4	1				378
220	4279.0	5				4279.7	3				396
230	4279.8	8				4280.4	7				414
240	4280.6	8				4281.1	7				432
250	4282.1	15				4282.4	13				450
260	4283.2	11				4283.9	15				468
270	4285.1	19				4285.7	18				486
280	4287.0	19				4287.5	18				504
290	4289.3	23				4289.9	24				522
300	4292.1	28				4292.5	26				540
310	4295.5	34				4295.7	32				558
320	4298.9	34				4298.9	32				576
330	4302.9	40				4303.2	43				594
340	4307.2	43				4307.6	44				612
350	4312.2	50				4312.6	50				630
360	4317.5	53				4317.8	52				648
370	4323.0	55				4323.3	55				666
380	4329.5	65				4329.9	66				684
390	4336.2	67				4336.7	68				702
400	4343.5	73				4343.6	69				720
410	4351.1	76				4351.4	78				738
420	4359.4	83				4359.4	80				756
430	4367.7	83				4368.1	87				774
440	4376.8	91				4376.9	88				792
450	4386.4	96				4386.7	98				810
460	4396.4	100				4396.6	99				828
470	4406.7	103				4406.8	102				846
480	4417.2	105				4417.8	110				864
490	4428.3	111				4428.6	108				882
500	4439.7	114	13.	25.	140.	4440.0	114	13.	25.	140.	900
510	4451.3	116				4451.5	115				918
520	4463.5	122				4463.7	122				936
530	4475.6	121				4475.8	121				954
540	4488.3	127				4488.6	128				972

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
90	4314.7										162
100	4301.2	-135									180
110	4294.1	- 71				4302.2					198
120	4289.5	- 46				4295.1	- 71				216
130	4286.0	- 35				4290.3	- 48				234
140	4283.8	- 22				4287.0	- 33				252
150	4282.3	- 15				4285.1	- 19				270
160	4281.4	- 9				4283.7	- 14				288
170	4280.6	- 8				4282.5	- 12				306
180	4280.1	- 5				4281.6	- 9				324
190	4280.1	0				4281.2	- 4				342
200	4280.5	4				4281.4	2				360
210	4280.3	- 2				4281.0	- 4				378
220	4280.5	2				4281.2	2				396
230	4281.0	5				4281.7	5				414
240	4281.7	7				4282.4	7				432
250	4283.0	13				4283.5	11				450
260	4284.4	14				4284.8	13				468
270	4285.8	14				4286.1	13				486
280	4288.0	22				4288.5	24				504
290	4290.3	23				4290.8	23				522
300	4292.8	25				4293.2	24				540
310	4296.0	32				4296.3	31				558
320	4299.3	33				4299.9	36				576
330	4303.5	42				4303.7	38				594
340	4307.8	43				4308.0	43				612
350	4312.7	49				4312.9	49				630
360	4317.9	52				4318.2	53				648
370	4323.7	58				4323.9	57				666
380	4330.0	63				4330.2	63				684
390	4336.8	68				4336.9	67				702
400	4344.1	73				4344.1	72				720
410	4351.4	73				4351.9	78				738
420	4359.7	83				4359.7	78				756
430	4368.4	87				4368.3	86				774
440	4377.2	88				4377.6	93				792
450	4386.8	96				4387.0	94				810
460	4396.6	98				4396.9	99				828
470	4406.9	103				4407.3	104				846
480	4417.6	107				4417.7	104				864
490	4428.6	110				4429.0	113				882
500	4439.9	113	12.	25.	139.	4440.3	113	12.	25.	139.	900
510	4451.8	119				4451.8	115				918
520	4463.6	118				4463.6	118				936
530	4476.0	124				4476.0	124				954
540	4488.4	124				4488.6	126				972

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb$_F$/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
550	4501.2	129				4501.3	127				990
560	4514.2	130				4514.4	131				1008
570	4527.4	132				4527.6	132				1026
580	4541.2	138				4541.4	138				1044
590	4554.7	135				4554.8	134				1062
600	4568.3	136	15.	30.	150.	4568.7	139	15.	30.	150.	1080
610	4582.4	141				4582.5	138				1098
620	4596.3	139				4596.7	142				1116
630	4610.6	143				4610.6	139				1134
640	4624.7	141				4624.7	141				1152
650	4639.3	146				4639.3	146				1170
660	4653.5	142				4653.5	142				1188
670	4668.0	145				4668.1	146				1206
680	4682.4	144				4682.7	146				1224
690	4696.8	144				4697.0	143				1242
700	4711.2	144	5.	30.	155.	4711.4	144	14.	30.	158.	1260
710	4725.5	143				4725.7	143				1278
720	4739.8	143				4740.1	144				1296
730	4754.2	144				4754.5	144				1314
740	4768.7	145				4768.9	144				1332
750	4783.0	143				4783.3	144				1350
760	4796.9	139				4797.1	138				1368
770	4811.2	143				4811.4	143				1386
780	4825.2	140				4825.7	143				1404
790	4839.5	143				4839.3	136				1422
800	4853.4	139	17.	35.	167.	4853.5	142	17.	34.	170.	1440
850	4922	69				4923	69				1530
900	4987	65	15.	39.	178.	4989	66	19.	36.	178.	1620
950	5052	65				5052	63				1710
1000	5112	60	14.	36.	179.	5112	60	17.	35.	184.	1800
1050	5171	59				5171	59				1890
1100	5226	55	20.	43.	193.	5226	55	20.	41.	199.	1980
1150	5283	57				5283	57				2070
1200	5335	52	22.	40.	217.	5335	52	17.	40.	207.	2160
1250	5387	52				5387	52				2250
1300	5440	53	26.	39.	222.	5440	53	23.	41.	217.	2340
1350	5492	52				5492	52				2430
1400	5543	51	26.	55.	230.	5543	51	24.	50.	234.	2520
1450	5594	51				5594	51				2610
1500	5646	52	17.	57.	261.	5646	52	33.	50.	249.	2700
1550	5698	52				5697	51				2790
1600	5756	58	36.	64.	293.	5751	54	37.	63.	279.	2880
1650	5818	62				5810	59				2970
1700	5887	69	64.	85.	339.	5869	59	40.	84.	316.	3060
1750	5957	70				5930	61				3150

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
550	4501.3	129				4501.5	129				990
560	4514.6	133				4514.8	133				1008
570	4527.8	132				4527.9	131				1026
580	4541.4	136				4541.6	137				1044
590	4554.9	135				4551.7	101				1062
600	4568.7	138	14.	29.	149.	4568.9	172	14.	29.	149.	1080
610	4582.5	138				4582.7	138				1098
620	4596.4	139				4596.8	141				1116
630	4610.6	142				4610.7	139				1134
640	4624.8	142				4625.1	144				1152
650	4639.2	144				4639.6	145				1170
660	4653.8	146				4653.9	143				1188
670	4668.1	143				4668.5	146				1206
680	4682.4	143				4682.8	143				1224
690	4697.1	147				4697.0	142				1242
700	4711.4	143	16.	31.	158.	4711.3	143	16.	31.	158.	1260
710	4725.7	143				4725.9	146				1278
720	4739.9	142				4740.2	143				1296
730	4754.3	144				4754.6	144				1314
740	4768.8	145				4769.1	145				1332
750	4783.1	143				4783.1	140				1350
760	4797.1	140				4797.3	142				1368
770	4811.3	142				4811.6	143				1386
780	4825.6	143				4825.5	139				1404
790	4839.5	139				4839.5	140				1422
800	4853.4	139	17.	35.	170.	4853.7	142	17.	36.	170.	1440
850	4923	70				4923	69				1530
900	4989	66	21.	36.	178.	4985	62	21.	36.	178.	1620
950	5052	63				5052	67				1710
1000	5112	60	18.	35.	185.	5112	60	17.	35.	185.	1800
1050	5171	59				5171	59				1890
1100	5226	55	20.	40.	200.	5226	55	20.	40.	200.	1980
1150	5283	57				5283	57				2070
1200	5335	52	17.	39.	205.	5335	52	18.	40.	205.	2160
1250	5387	52				5387	52				2250
1300	5440	53	23.	42.	216.	5440	53	22.	42.	215.	2340
1350	5492	52				5492	52				2430
1400	5543	51	23.	48.	234.	5543	51	23.	48.	233.	2520
1450	5594	51				5594	51				2610
1500	5646	52	38.	48.	247.	5646	52	37.	47.	245.	2700
1550	5697	51				5701	55				2790
1600	5751	54	38.	62.	275.	5751	50	38.	61.	272.	2880
1650	5809	58				5808	57				2970
1700	5866	57	34.	83.	308.	5865	57	32.	81.	303.	3060
1750	5920	54				5918	53				3150

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb$_F$/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
1800	6034	77	77.	127.	436.	5998	68	64.	103.	373.	3240
1850	6128	94				6068	70				3330
1900	6242	114	109.	179.	549.	6145	77	85.	136.	459.	3420
1950	6385	143				6241	96				3510
2000	6561	176	146.	243.	709.	6357	116	105.	177.	558.	3600
2050	6757	196				6476	119				3690
2100	6975	218	224.	331.	978.	6613	137	156.	242.	725.	3780
2150	7265	290				6785	172				3870
2200	7613	348	294.	448.	1305.	6979	194	204.	321.	927.	3960
2250	8045	432				7221	242				4050
2300	8563	518	359.	595.	1768.	7492	271	254.	405.	1189.	4140
2350	9129	566				7811	319				4230
2400	9809	680	477.	791.	2428.	8183	372	326.	517.	1544.	4320
2450	10631	822				8618	435				4410
2500	11561	930	564.	999.	3287.	9125	507	385.	655.	2008.	4500
2550	12466	905				9652	527				4590
2600	13710	1244	627.	1203.	4346.	10233	581	454.	803.	2580.	4680
2650	14940	1230				10861	628				4770
2700	16285	1345	655.	1337.	5536.	11562	701	508.	929.	3257.	4860
2750	17725	1440				12291	729				4950
2800	19221	1496	641.	1408.	6786.	13074	783	532.	1052.	4088.	5040
2850											5130
2900	22196	2975	605.	1394.	7757.	15722	2648	540.	1139.	4957.	5220
2950											5310
3000	24795	2599	552.	1302.	8210.	17902	2180	521.	1169.	5753.	5400
3100	26619	1824	495.			20059	2157	495.	1140.	6390.	5580
3200						22065	2006	477.	1090.	6820.	5760
3300						23718	1653	449.	1060.	6850.	5940
3400						24736	1018	460.	990.	6600.	6120
3500						25176	440	445.	920.	6090.	6300
3600						25262	86	410.	870.	5380.	6480
3700						25096	-166	414.	820.	4690.	6660
3800						25093	- 3	313.	700.	3920.	6840
3900						25688	595	242.	530.	3210.	7020
4000						26963	1275	232.	470.	2650.	7200
4100						29138	2175	196.	410.	2100.	7380
4200						32256	3118	163.	360.	1710.	7560
4300						36131	3875	126.	290.	1470.	7740
4400						40796	4665	112.	210.	1260.	7920
4500						45812	5016	30.	190.	1090.	8100
4600						50835	5023	160.	220.	950.	8280
4700						55831	4996	119.	230.	840.	8460
4800						60584	4753	97.	180.	480.	8640

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosph e Pressure					1.0 Atmosphere Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
1800	5984	64	59.	94.	352.	5980	62	57.	90.	342.	3240
1850	6050	66				6043	63				3330
1900	6127	77	77.	123.	431.	6113	70	73.	116.	415.	3420
1950	6211.	84				6193	80				3510
2000	6305	94	95.	157.	514.	6281	88	90.	147.	490.	3600
2050	6409	104				6373	92				3690
2100	6521	112	136.	218.	656.	6477	104	126.	205.	619.	3780
2150	6657	136				6599	122				3870
2200	6823	166	178.	286.	825.	6744	145	165.	266.	771.	3960
2250	7011	188				6919	175				4050
2300	7229	218	227.	351.	1035.	7118	199	212.	322.	954.	4140
2350	7490	261				7342	224				4230
2400	7789	299	280.	442.	1318.	7603	261	254.	402.	1200.	4320
2450	8123	334				7893	290				4410
2500	8511	388	330.	558.	1686.	8228	335	301.	507.	1521.	4500
2550	8915	404				8600	372				4590
2600	9356	441	399.	682.	2136.	9045	445	367.	616.	1907.	4680
2650	9842	486				9521	476				4770
2700	10383	541	447.	797.	2666.	10058	537	411.	722.	2359.	4860
2750	10962	579				10658	600				4950
2800	11562	600	476.	914.	3352.	11296	638	442.	832.	2962.	5040
2850						12022	726				5130
2900	13811	2249	506.	1005.	4062.	12792	770	481.	921.	3572.	5220
2950						13589	797				5310
3000	15668	1857	488.	1054.	4758.	14430	841	465.	978.	4187.	5400
3100	17599	1931	468.	1060.	5440.	16180	1750	449.	1000.	4860.	5580
3200	19535	1936	455.	1050.	6010.	17999	1819	439.	1000.	5450.	5760
3300	21322	1787	437.	1030.	6290.	19766	1767	427.	990.	5820.	5940
3400	22681	1359	445.	970.	6300.	21231	1465	432.	950.	5970.	6120
3500	23579	898	438.	920.	6090.	22340	1109	425.	910.	5940.	6300
3600	24125	546	407.	890.	5680.	23154	814	396.	880.	5710.	6480
3700	24280	155	412.	860.	5200.	23570	416	400.	860.	5360.	6660
3800	24312	32	359.	770.	4580.	23756	186	378.	790.	4870.	6840
3900	24611	299	306.	650.	3970.	24047	291	338.	710.	4370.	7020
4000	25257	646	277.	590.	3380.	24500	453	301.	660.	3810.	7200
4100	26496	1239	255.	520.	2800.	25348	848	292.	590.	3260.	7380
4200	28476	1980	221.	450.	2310.	26772	1424	259.	510.	2760.	7560
4300	31090	2614	163.	370.	1980.	28713	1941	198.	440.	2380.	7740
4400	34451	3361	158.	300.	1720.	31326	2613	187.	370.	2070.	7920
4500	38333	3882	87.	270.	1470.	34486	3160	134.	330.	1760.	8100
4600	42466	4133	172.	300.	1270.	37977	3491	179.	340.	1510.	8280
4700	46908	4442	127.	250.	1140.	41890	3913	139.	270.	1320.	8460
4800	51465	4557	148.	260.	920.	46072	4182	161.	280.	1120.	8640

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb$_F$/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
110	4302.2					4379.1					198
120	4295.1	- 71				4350.5	-286				216
130	4290.3	- 48				4331.8	-187				234
140	4287.0	- 33				4319.1	-127				252
150	4285.1	- 19				4310.8	- 83				270
160	4283.7	- 14				4303.9	- 69				288
170	4282.5	- 12				4299.4	- 45				306
180	4281.6	- 9				4295.7	- 37				324
190	4281.2	- 4				4293.3	- 24				342
200	4281.4	2				4291.5	- 18				360
210	4281.0	- 4				4289.9	- 16				378
220	4281.2	2				4289.2	- 7				396
230	4281.7	5				4288.7	- 5				414
240	4282.4	7				4288.7	0				432
250	4283.5	11				4289.0	3				450
260	4284.8	13				4289.7	7				468
270	4286.1	13				4290.9	12				486
280	4288.5	24				4292.5	16				504
290	4290.8	23				4294.5	20				522
300	4293.2	24				4296.7	22				540
310	4296.3	31				4299.5	28				558
320	4299.9	36				4303.0	35				576
330	4303.7	38				4306.8	38				594
340	4308.0	43				4310.7	39				612
350	4312.9	49				4315.4	47				630
360	4318.2	53				4320.4	50				648
370	4323.9	57				4326.0	56				666
380	4330.2	63				4332.5	65				684
390	4336.9	67				4338.9	64				702
400	4344.1	72				4346.3	74				720
410	4351.9	78				4353.4	71				738
420	4359.7	78				4361.5	81				756
430	4368.3	86				4370.1	86				774
440	4377.6	93				4379.1	90				792
450	4387.0	94				438 5	94				810
460	4396.9	99				4398.3	98				828
470	4407.3	104				4408.7	104				846
480	4417.7	104				4419.1	104				864
490	4429.0	113				4430.0	109				882
500	4440.3	113	12.	25.	139.	4441.3	113	14.	25.	135.	900
510	4451.8	115				4452.9	116				918
520	4463.6	118				4464.8	119				936
530	4476.0	124				4477.2	124				954
540	4488.6	126				4489.7	125				972

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	c_v	Δ	c_v Residuals, for mole % moisture content 0.1	1.0	5.0	c_v	Δ	c_v Residuals, for mole % moisture content 0.1	1.0	5.0	
110	4456.					4669.					198
120	4406.	-50				4528.	-41				216
130	4373.	-33				4450.	-78				234
140	4352.	-21				4405.	-45				252
150	4336.	-16				4374.2	-31				270
160	4324.2	-118				4353.5	-207				288
170	4316.2	- 80				4338.6	-149				306
180	4310.1	- 61				4327.8	-108				324
190	4305.3	- 48				4320.0	- 78				342
200	4301.9	- 34				4315.4	- 46				360
210	4299.1	- 28				4309.2	- 62				378
220	4297.4	- 17				4305.8	- 34				396
230	4295.5	- 19				4303.4	- 24				414
240	4294.7	- 8				4301.8	- 16				432
250	4294.6	- 1				4300.7	- 11				450
260	4294.5	- 1				4299.8	- 9				468
270	4295.4	9				4300.0	2				486
280	4296.7	13				4300.8	8				504
290	4298.5	18				4302.2	14				522
300	4300.4	19				4303.7	15				540
310	4303.0	26				4306.1	24				558
320	4305.7	27				4308.6	25				576
330	4309.3	36				4312.2	36				594
340	4313.4	41				4315.8	36				612
350	4317.8	44				4320.4	46				630
360	4323.1	53				4325.2	48				648
370	4328.3	52				4330.4	52				666
380	4334.4	61				4336.5	61				684
390	4341.0	66				4342.7	62				702
400	4348.2	72				4350.0	73				720
410	4355.3	71				4357.4	74				738
420	4363.2	79				4365.3	79				756
430	4371.8	86				4373.8	85				774
440	4380.4	86				4382.5	87				792
450	4390.0	96				4391.8	93				810
460	4399.8	98				4401.5	97				828
470	4409.9	101				4411.5	100				846
480	4420.5	106				4421.9	104				864
490	4431.4	109				4432.9	110				882
500	4442.5	111	15.	25.	131.	4443.7	108	15.	25.	126.	900
510	4454.1	116				4455.1	114				918
520	4466.0	119				4467.1	120				936
530	4478.7	127				4479.4	123				954
540	4491.0	123				4492.0	126				972

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
550	4501.5	129				4502.5	128				990
560	4514.8	133				4515.6	131				1008
570	4527.9	131				4528.9	133				1026
580	4541.6	137				4542.4	135				1044
590	4551.7	101				4556.1	137				1062
600	4568.9	172	14.	29.	149.	4569.8	137	12.	27.	147.	1080
610	4582.7	138				4584.0	142				1098
620	4596.8	141				4597.8	138				1116
630	4610.7	139				4611.8	140				1134
640	4625.1	144				4626.1	143				1152
650	4639.6	145				4640.4	143				1170
660	4653.9	143				4654.5	141				1188
670	4668.5	146				4669.0	145				1206
680	4682.8	143				4683.5	145				1224
690	4697.0	142				4697.7	142				1242
700	4711.3	143	16.	31.	158.	4712.3	146	15.	33.	158.	1260
710	4725.9	146				4726.5	142				1278
720	4740.2	143				4740.8	143				1296
730	4754.6	144				4755.3	145				1314
740	4769.1	145				4769.6	143				1332
750	4783.1	140				4783.8	142				1350
760	4797.3	142				4797.9	141				1368
770	4811.6	143				4812.2	143				1386
780	4825.5	139				4826.1	139				1404
790	4839.5	140				4840.3	142				1422
800	4853.7	142	17.	36.	170.	4854.4	141	17.	37.	170.	1440
850	4923	69				4925	71				1530
900	4985	62	21.	36.	178.	4987	62	20.	38.	178.	1620
950	5052	67				5054	67				1710
1000	5112	60	17.	35.	185.	5114	60	15.	35.	182.	1800
1050	5171	59				5173	59				1890
1100	5226	55	20.	40.	200.	5227	54	20.	40.	198.	1980
1150	5283	57				5285	58				2070
1200	5335	52	18.	40.	205.	5337	52	20.	40.	208.	2160
1250	5387	52				5389	52				2250
1300	5440	53	22.	42.	215.	5441	52	22.	42.	215.	2340
1350	5492	52				5494	53				2430
1400	5543	51	23.	48.	233.	5544	50	25.	48.	229.	2520
1450	5594	51				5596	52				2610
1500	5646	52	37.	47.	245.	5647	51	28.	50.	244.	2700
1550	5701	55				5699	52				2790
1600	5751	50	38.	61.	272.	5749	50	32.	54.	259.	2880
1650	5808	57				5804	55				2970
1700	5865	57	32.	81.	303.	5860	56	38.	70.	286.	3060
1750	5918	53				5911	51				3150

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
550	4503.8	128				4504.8	128				990
560	4516.8	130				4518.1	133				1008
570	4530.0	132				4531.4	133				1026
580	4543.4	134				4544.8	134				1044
590	4557.1	137				4558.3	135				1062
600	4570.6	135	12.	27.	147.	4572.0	137	12.	27.	147.	1080
610	4584.4	138				4586.0	140				1098
620	4598.3	139				4599.6	136				1116
630	4612.5	142				4613.3	137				1134
640	4627.0	145				4627.3	140				1152
650	4640.9	139				4641.8	145				1170
660	4655.5	146				4656.0	142				1188
670	4669.9	144				4670.6	146				1206
680	4684.3	144				4685.2	146				1224
690	4698.7	144				4699.5	143				1242
700	4713.1	144	14.	33.	158.	4713.9	144	15.	33.	158.	1260
710	4727.3	142				4728.2	143				1278
720	4741.5	142				4742.2	140				1296
730	4755.9	144				4756.8	146				1314
740	4770.1	142				4770.9	141				1332
750	4784.6	145				4785.4	145				1350
760	4798.7	141				4799.5	141				1368
770	4812.8	141				4814.0	145				1386
780	4826.9	141				4828.0	140				1404
790	4841.1	142				4842.0	140				1422
800	4854.9	138	17.	37.	170.	4856.2	142	17.	36.	170.	1440
850	4925	70				4925	69				1530
900	4990	65	19.	38.	178.	4989	64	19.	37.	178.	1620
950	5055	65				5055	66				1710
1000	5115	60	16.	35.	183.	5116	61	17.	33.	183.	1800
1050	5173	58				5173	57				1890
1100	5230	57	20.	40.	196.	5230	57	21.	41.	196.	1980
1150	5284	54				5285	55				2070
1200	5338	54	20.	40.	208.	5337	52	19.	40.	207.	2160
1250	5390	52				5391	54				2250
1300	5443	53	22.	42.	216.	5445	54	22.	41.	215.	2340
1350	5495	52				5496	51				2430
1400	5544	49	26.	48.	228.	5546	50	26.	47.	227.	2520
1450	5596	52				5596	50				2610
1500	5646	50	23.	50.	242.	5646	50	22.	51.	241.	2700
1550	5699	53				5695	49				2790
1600	5749	50	29.	52.	254.	5749	54	28.	52.	251.	2880
1650	5804	55				5804	55				2970
1700	5858	54	40.	64.	279.	5860	56	40.	61.	275.	3060
1750	5915	57				5915	55				3150

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
1800	5980	62	57.	90.	342.	5970	59	48.	80.	316.	3240
1850	6043	63				6023	53				3330
1900	6113	70	73.	116.	415.	6086	63	53.	94.	360.	3420
1950	6193	80				6150	64				3510
2000	6281	88	90.	147.	490.	6218	68	77.	121.	422.	3600
2050	6373	92				6292	74				3690
2100	6477	104	126.	205.	619.	6367	75	99.	162.	513.	3780
2150	6599	122				6453	86				3870
2200	6744	145	165.	266.	771.	6545	92	123.	196.	606.	3960
2250	6919	175				6657	112				4050
2300	7118	199	212.	322.	954.	6785	128	155.	236.	723.	4140
2350	7342	224				6927	142				4230
2400	7603	261	254.	402.	1200.	7076	149	184.	294.	879.	4320
2450	7893	290				7245	169				4410
2500	8228	335	301.	507.	1521.	7432	187	223.	360.	1075.	4500
2550	8600	372				7642	210				4590
2600	9045	445	367.	616.	1907.	7887	245	266.	430.	1296.	4680
2650	9521	476				8151	264				4770
2700	10058	537	411.	722.	2359.	8440	289	297.	501.	1544.	4860
2750	10658	600				8797	357				4950
2800	11296	638	442.	832.	2962.	9119	322	334.	580.	1886.	5040
2850	12022	726				9508	389				5130
2900	12792	770	481.	921.	3572.	9944	436	367.	646.	2210.	5220
2950	13589	797				10393	449				5310
3000	14430	841	465.	978.	4187.	10869	476	373.	712.	2565.	5400
3100	16180	1750	449.	1000.	4860.	11968	1099	378.	760.	3010.	5580
3200	17999	1819	439.	1000.	5450.	13172	1204	373.	790.	3470.	5760
3300	19766	1767	427.	990.	5820.	14483	1311	371.	820.	3900.	5940
3400	21231	1465	432.	950.	5970.	15799	1316	369.	810.	4290.	6120
3500	22340	1109	425.	910.	5940.	17096	1297	354.	800.	4590.	6300
3600	23154	814	396.	880.	5710.	18376	1280	335.	780.	4820.	6480
3700	23570	416	400.	860.	5360.	19475	1099	334.	780.	4910.	6660
3800	23756	186	378.	790.	4870.	20316	841	371.	770.	4910.	6840
3900	24047	291	338.	710.	4370.	21038	722	358.	770.	4840.	7020
4000	24500	453	301.	660.	3810.	21563	525	327.	750.	4590.	7200
4100	25348	848	292.	590.	3260.	22004	441	353.	720.	4340.	7380
4200	26772	1424	259.	510.	2760.	22482	478	346.	670.	4050.	7560
4300	28713	1941	198.	440.	2380.	23037	555	308.	630.	3670.	7740
4400	31326	2613	187.	370.	2070.	23864	827	271.	600.	3340.	7920
4500	34486	3160	134.	330.	1760.	24990	1126	269.	550.	2960.	8100
4600	37977	3491	179.	340.	1510.	26391	1401	232.	490.	2600.	8280
4700	41890	3913	139.	270.	1320.	28164	1773	228.	440.	2270.	8460
4800	46072	4182	161.	280.	1120.	30367	2203	189.	350.	2000.	8640

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
1800	5969	54	45.	77.	310.	5967	52	43.	76.	306.	3240
1850	6021	52				6019	52				3330
1900	6080	59	48.	88.	343.	6078	59	45.	84.	333.	3420
1950	6137	57				6133	55				3510
2000	6201	64	71.	113.	400.	6196	63	67.	109.	387.	3600
2050	6270	69				6263	67				3690
2100	6341	71	92.	148.	481.	6332	69	88.	138.	461.	3780
2150	6412	71				6398	66				3870
2200	6491	79	111.	173.	557.	6476	78	104.	161.	530.	3960
2250	6591	100				6563	87				4050
2300	6705	114	134.	210.	656.	6666	103	123.	197.	619.	4140
2350	6819	114				6768	102				4230
2400	6941	122	164.	264.	788.	6880	112	154.	247.	739.	4320
2450	7080	139				7000	120				4410
2500	7234	154	201.	318.	952.	7139	139	190.	296.	887.	4500
2550	7404	170				7288	149				4590
2600	7596	192	234.	378.	1132.	7460	172	216.	350.	1044.	4680
2650	7799	203				7640	180				4770
2700	8028	229	262.	436.	1331.	7843	203	242.	400.	1218.	4860
2750	8277	249				8059	216				4950
2800	8552	275	300.	505.	1598.	8303	244	280.	465.	1447.	5040
2850	8853	301				8577	274				5130
2900	9186	333	323.	564.	1863.	8878	301	298.	520.	1686.	5220
2950	9543	357				9194	316				5310
3000	9934	391	339.	625.	2156.	9523	329	317.	576.	1950.	5400
3100	10830	896	350.	680.	2510.	10244	721	332.	620.	2250.	5580
3200	11805	975	347.	700.	2880.	11091	847	331.	650.	2570.	5760
3300	12886	1081	345.	740.	3250.	12034	943	329.	690.	2900.	5940
3400	14005	1119	344.	740.	3610.	13019	985	329.	700.	3210.	6120
3500	15162	1157	327.	740.	3930.	14055	1036	311.	700.	3520.	6300
3600	16364	1202	312.	730.	4210.	15156	1101	299.	700.	3800.	6480
3700	17479	1115	313.	720.	4390.	16216	1060	301.	690.	4010.	6660
3800	18421	942	340.	730.	4520.	17162	946	317.	690.	4190.	6840
3900	19285	864	327.	730.	4550.	18073	911	302.	690.	4260.	7020
4000	19962	677	310.	710.	4460.	18828	755	294.	680.	4260.	7200
4100	20520	558	336.	710.	4340.	19478	650	318.	690.	4230.	7380
4200	21014	494	343.	680.	4200.	20037	559	332.	670.	4170.	7560
4300	21481	467	323.	650.	3910.	20531	494	322.	650.	3950.	7740
4400	22091	610	281.	640.	3650.	21107	576	281.	650.	3750.	7920
4500	22840	749	286.	590.	3330.	21731	624	286.	610.	3500.	8100
4600	23766	926	260.	530.	3010.	22468	737	276.	560.	3220.	8280
4700	24938	1172	264.	510.	2730.	23370	902	280.	550.	2990.	8460
4800	26466	1528	213.	420.	2430.	24560	1190	231.	460.	2690.	8640

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
110	4669.										198
120	4528.	-141									216
130	4450.	- 78									234
140	4405.	- 45									252
150	4374.2	-308									270
160	4353.5	-207				4765					288
170	4338.6	-149				4628	-137				306
180	4327.8	-108				4545	- 83				324
190	4320.0	- 78				4489	- 56				342
200	4315.4	- 46				4449	- 40				360
210	4309.2	- 62				4422	- 27				378
220	4305.8	- 34				4402	- 20				396
230	4303.4	- 24				4384	- 18				414
240	4301.8	- 16				4373	- 11				432
250	4300.7	- 11				4364	- 9				450
260	4299.8	- 9				4355	- 9				468
270	4300.0	2				4349	- 6				486
280	4300.8	8				4345	- 4				504
290	4302.2	14				4343	- 2				522
300	4303.7	15				4341	- 2				540
310	4306.1	24				4340	- 1				558
320	4308.6	25				4340	0				576
330	4312.2	36				4341	1				594
340	4315.8	36				4343	2				612
350	4320.4	46				4346	3				630
360	4325.2	48				4349	3				648
370	4330.4	52				4352	3				666
380	4336.5	61				4358	6				684
390	4342.7	62				4362	4				702
400	4350.0	73				4370	8				720
410	4357.4	74				4375	5				738
420	4365.3	79				4382	7				756
430	4373.8	85				4390	8				774
440	4382.5	87				4398	8				792
450	4391.8	93				4408	10				810
460	4401.5	97				4416	8				828
470	4411.5	100				4425	9				846
480	4421.9	104				4436	11				864
490	4432.9	110				4446	10				882
500	4443.7	108	15.	25.	126.	4457	11	10.	17.	82.	900
510	4455.1	114				4468	11				918
520	4467.1	120				4478	10				936
530	4479.4	123				4491	13				954
540	4492.0	126				4503	12				972

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
180	4912										324
190	4743	-169									342
200	4636	-107				4881					360
210	4569	- 67				4748	-133				378
220	4518	- 51				4658	- 90				396
230	4483	- 35				4594	- 64				414
240	4455	- 28				4546	- 48				432
250	4433	- 22				4509	- 37				450
260	4419	- 14				4483	- 26				468
270	4405	- 14				4463	- 20				486
280	4393	- 12				4444	- 19				504
290	4386	- 7				4431	- 13				522
300	4380	- 6				4420	- 11				540
310	4375	- 5				4413	- 7				558
320	4374	- 1				4406	- 7				576
330	4372	- 2				4404	- 2				594
340	4372	0				4400	- 4				612
350	4372	0				4399	- 1				630
360	4373	1				4398	- 1				648
370	4377	4				4400	2				666
380	4378	1				4400	0				684
390	4383	5				4404	4				702
400	4389	6				4408	4				720
410	4394	5				4412	4				738
420	4402	8				4419	7				756
430	4408	6				4426	7				774
440	4416	8				4432	6				792
450	4423	7				4440	8				810
460	4431	8				4446	6				828
470	4440	9				4454	8				846
480	4450	10				4462	8				864
490	4459	9				4472	10				882
500	4469	10				4482	10				900
510	4480	11				4492	10				918
520	4490	10				4503	11				936
530	4502	12				4513	10				954
540	4515	13				4525	12				972

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
550	4504.8	128				4516	13				990
560	4518.1	133				4528	12				1008
570	4531.4	133				4541	13				1026
580	4544.8	134				4553	12				1044
590	4558.3	135				4567	14				1062
600	4572.0	137	12.	27.	147.	4582	15	13.	28.	145.	1080
610	4586.0	140				4594	12				1098
620	4599.6	136				4608	14				1116
630	4613.3	137				4622	14				1134
640	4627.3	140				4636	14				1152
650	4641.8	145				4650	14				1170
660	4656.0	142				4664	14				1188
670	4670.6	146				4678	14				1206
680	4685.2	146				4692	14				1224
690	4699.5	143				4707	15				1242
700	4713.9	144	15.	33.	158.	4721	14	18.	31.	157.	1260
710	4728.2	143				4735	14				1278
720	4742.2	140				4749	14				1296
730	4756.8	146				4764	15				1314
740	4770.9	141				4777	13				1332
750	4785.4	145				4792	15				1350
760	4799.5	141				4805	13				1368
770	4814.0	145				4820	15				1386
780	4828.0	140				4834	14				1404
790	4842.0	140				4848	14				1422
800	4856.2	142	17.	36.	170.	4863	15	17.	33.	170.	1440
850	4925	69				4935	72				1530
900	4989	64	19.	37.	178.	4996	61	16.	32.	176.	1620
950	5055	66				5061	65				1710
1000	5116	61	17.	33.	183.	5120	59	24.	32.	187.	1800
1050	5173	57				5178	58				1890
1100	5230	57	21.	41.	196.	5235	57	23.	39.	195.	1980
1150	5285	55				5289	54				2070
1200	5337	52	19.	40.	207.	5342	53	13.	40.	200.	2160
1250	5391	54				5395	53				2250
1300	5445	54	22.	41.	215.	5449	54	19.	40.	215.	2340
1350	5496	51				5499	50				2430
1400	5546	50	26.	47.	227.	5548	49	24.	43.	228.	2520
1450	5596	50				5600	52				2610
1500	5646	50	22.	51.	241.	5650	50	28.	49.	236.	2700
1550	5695	49				5696	46				2790
1600	5749	54	28.	52.	251.	5745	49	28.	56.	247.	2880
1650	5804	55				5799	54				2970
1700	5860	56	40.	61.	275.	5858	59	30.	61.	267.	3060
1750	5915	55				5912	54				3150

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for *dry and moist air (Continued)*
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
550	4526	11				4536	11				990
560	4538	12				4549	13				1008
570	4551	13				4562	13				1026
580	4563	12				4574	12				1044
590	4576	13				4587	13				1062
600	4590	14				4600	13				1080
610	4603	13				4613	13				1098
620	4617	14				4627	14				1116
630	4630	13				4640	13				1134
640	4644	14				4653	13				1152
650	4659	15				4666	13				1170
660	4672	13				4681	15				1188
670	4687	15				4695	14				1206
680	4700	13				4707	12				1224
690	4714	14				4722	15				1242
700	4728	14				4737	15				1260
710	4742	14				4750	13				1278
720	4756	14				4764	14				1296
730	4771	15				4778	14				1314
740	4785	14				4792	14				1332
750	4799	14				4805	13				1350
760	4813	14				4818	13				1368
770	4827	14				4833	15				1386
780	4841	14				4847	14				1404
790	4854	13				4861	14				1422
800	4870	16	18.	35.	168.	4876	15				1440
850	4937	67				4943	67				1530
900	5002	65	16.	32.	174.	5006	63				1620
950	5065	63				5070	64				1710
1000	5125	60	23.	35.	186.	5131	61				1800
1050	5182	57				5186	55				1890
1100	5238	56	22.	38.	196.	5243	57	20.	37.	195.	1980
1150	5293	55				5298	55				2070
1200	5346	53	12.	39.	199.	5349	51	16.	38.	203.	2160
1250	5398	52				5401	52				2250
1300	5452	54	19.	42.	215.	5455	54	21.	45.	217.	2340
1350	5503	51				5505	50				2430
1400	5553	50	23.	43.	228.	5555	50	22.	44.	226.	2520
1450	5603	50				5605	50				2610
1500	5652	49	32.	47.	235.	5656	51	30.	46.	234.	2700
1550	5700	48				5701	45				2790
1600	5744	44	29.	58.	247.	5745	44	29.	56.	246.	2880
1650	5798	54				5798	53				2970
1700	5853	55	24.	62.	264.	5851	53	23.	61.	262.	3060
1750	5906	53				5904	53				3150

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			c_v Residuals, for mole % moisture content					c_v Residuals, for mole % moisture content			
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
1800	5967	52	43.	76.	306.	5962	50	37.	66.	290.	3240
1850	6019	52				6017	55				3330
1900	6078	59	45.	84.	333.	6069	52	46.	75.	312.	3420
1950	6133	55				6125	56				3510
2000	6196	63	67.	109.	387.	6177	52	46.	86.	340.	3600
2050	6263	67				6234	57				3690
2100	6332	69	86.	138.	461.	6297	63	64.	109.	396.	3780
2150	6398	66				6355	58				3870
2200	6476	78	104.	161.	530.	6418	63	85.	135.	453.	3960
2250	6563	87				6482	64				4050
2300	6666	103	123.	197.	619.	6556	74	94.	157.	507.	4140
2350	6768	102				6629	73				4230
2400	6880	112	154.	247.	739.	6711	82	120.	189.	589.	4320
2450	7000	120				6796	85				4410
2500	7139	139	190.	296.	887.	6887	91	147.	228.	689.	4500
2550	7288	149				6986	99				4590
2600	7460	172	216.	350.	1044.	7086	100	163.	260.	789.	4680
2650	7640	180				7191	105				4770
2700	7843	203	242.	400.	1218.	7312	121	181.	294.	898.	4860
2750	8059	216				7444	132				4950
2800	8303	244	280.	465.	1447.	7586	142	206.	341.	1035.	5040
2850	8577	274				7738	152				5130
2900	8878	301	298.	520.	1686.	7897	159	237.	390.	1199.	5220
2950	9194	316				8076	179				5310
3000	9523	329	317.	576.	1950.	8269	193	248.	422.	1364.	5400
3100	10244	721	332.	620.	2250.	8687	418	260.	460.	1540.	5580
3200	11091	847	331.	650.	2570.	9162	475	270.	490.	1720.	5760
3300	12034	943	329.	690.	2900.	9701	539	273.	520.	1910.	5940
3400	13019	985	329.	700.	3210.	10260	559	275.	540.	2070.	6120
3500	14055	1036	311.	700.	3520.	10849	589	263.	550.	2270.	6300
3600	15156	1101	299.	700.	3800.	11501	652	257.	560.	2470.	6480
3700	16216	1060	301.	690.	4010.	12178	677	258.	560.	2650.	6660
3800	17162	946	317.	690.	4190.	12870	692	242.	550.	2860.	6840
3900	18073	911	302.	690.	4260.	13642	772	227.	540.	2990.	7020
4000	18828	755	294.	680.	4260.	14392	750	240.	530.	3140.	7200
4100	19478	650	318.	690.	4230.	15172	780	239.	560.	3280.	7380
4200	20037	559	332.	670.	4170.	15918	746	246.	560.	3410.	7560
4300	20531	494	322.	650.	3950.	16597	679	258.	550.	3450.	7740
4400	21107	576	281.	650.	3750.	17287	690	242.	560.	3490.	7920
4500	21731	624	286.	610.	3500.	17872	585	249.	560.	3470.	8100
4600	22468	737	276.	560.	3220.	18421	549	281.	570.	3420.	8280
4700	23370	902	280.	550.	2990.	18949	528	276.	570.	3410.	8460
4800	24560	1190	231.	460.	2690.	19515	566	281.	560.	3240.	8640

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure		c_v Residuals, for mole % moisture content			100.0 Atmospheres Pressure		c_v Residuals, for mole % moisture content			T (°R)
	c_v	Δ	0.1	1.0	5.0	c_v	Δ	0.1	1.0	5.0	
1800	5960	54	34.	62.	283.	5958	54	33.	61.	279.	3240
1850	6014	54				6012	54				3330
1900	6065	51	47.	72.	307.	6062	50	46.	70.	303.	3420
1950	6122	57				6118	56				3510
2000	6174	52	40.	79.	327.	6170	52	38.	76.	322.	3600
2050	6228	54				6224	54				3690
2100	6287	59	55.	101.	375.	6284	60	51.	97.	363.	3780
2150	6347	60				6340	56				3870
2200	6404	57	79.	131.	431.	6398	58	74.	127.	415.	3960
2250	6469	65				6456	58				4050
2300	6532	63	89.	145.	474.	6516	60	87.	139.	456.	4140
2350	6599	67				6579	63				4230
2400	6671	72	108.	168.	545.	6651	72	100.	156.	521.	4320
2450	6742	71				6719	68				4410
2500	6815	73	130.	208.	631.	6788	69	118.	195.	598.	4500
2550	6893	78				6861	73				4590
2600	6981	88	147.	230.	715.	6940	79	140.	215.	675.	4680
2650	7074	93				7030	90				4770
2700	7168	94	161.	261.	805.	7119	89	150.	243.	756.	4860
2750	7278	110				7214	95				4950
2800	7388	110	178.	303.	926.	7315	101	162.	280.	867.	5040
2850	7509	121				7423	108				5130
2900	7633	124	226.	349.	1054.	7534	111	217.	324.	970.	5220
2950	7772	139				7655	121				5310
3000	7917	145	224.	371.	1168.	7793	138	209.	341.	1053.	5400
3100	8266	349	231.	410.	1310.	8041	248	214.	380.	1180.	5580
3200	8630	364	247.	440.	1480.	8344	303	233.	420.	1330.	5760
3300	9066	436	255.	460.	1640.	8726	382	244.	430.	1490.	5940
3400	9529	463	254.	490.	1790.	9146	420	241.	450.	1660.	6120
3500	10022	493	245.	490.	1960.	9602	456	235.	460.	1810.	6300
3600	10574	552	242.	510.	2130.	10123	521	232.	480.	1970.	6480
3700	11146	572	238.	510.	2270.	10657	534	225.	490.	2090.	6660
3800	11722	576	228.	500.	2450.	11175	518	227.	480.	2250.	6840
3900	12352	630	223.	510.	2600.	11718	543	226.	490.	2410.	7020
4000	12960	608	232.	500.	2710.	12217	499	229.	490.	2480.	7200
4100	13618	658	222.	510.	2850.	12758	541	218.	490.	2610.	7380
4200	14277	659	213.	510.	2960.	13310	552	198.	470.	2680.	7560
4300	14892	615	222.	500.	3050.	13832	522	199.	470.	2790.	7740
4400	15545	653	218.	490.	3140.	14409	577	203.	450.	2880.	7920
4500	16132	587	233.	510.	3150.	14964	555	225.	480.	2890.	8100
4600	16685	553	249.	530.	3170.	15502	538	221.	500.	2930.	8280
4700	17226	541	243.	510.	3200.	16053	551	217.	460.	2960.	8460
4800	17759	533	274.	530.	3140.	16590	537	257.	490.	2960.	8640

Table 1510.06 SPECIFIC HEAT AT CONSTANT VOLUME (c_v in ft-lb_F/slug °R) for dry and moist air (Concluded)
(See Section 1500.3 for definition of residuals)

1510.07 Specific Heat at Constant Pressure

0.01 Atmosphere Pressure							
T (°K)	c_p	Δ	T (°R)	T (°K)	c_p	Δ	T (°R)
50	6007.9		90	300	6008.7	27	540
60	6000.8	- 71	108	310	6012.0	33	558
70	5997.4	- 34	126	320	6015.4	34	576
80	5995.7	- 17	144	330	6019.5	41	594
90	5994.8	- 9	162	340	6023.8	43	612
100	5994.3	- 5	180	350	6028.6	48	630
110	5993.9	- 4	198	360	6033.9	53	648
120	5993.8	- 1	216	370	6039.6	57	666
130	5993.6	- 2	234	380	6046.1	65	684
140	5993.6	0	252	390	6052.8	67	702
150	5993.6	0	270	400	6060.0	72	720
160	5993.6	0	288	410	6067.6	76	738
170	5993.6	0	306	420	6075.8	82	756
180	5993.8	2	324	430	6084.4	86	774
190	5993.9	1	342	440	6093.5	91	792
200	5994.5	6	360	450	6102.9	94	810
210	5994.8	3	378	460	6112.9	100	828
220	5995.3	5	396	470	6123.2	103	846
230	5996.2	9	414	480	6133.8	106	864
240	5997.0	8	432	490	6144.8	110	882
250	5998.4	14	450	500	6156.2	114	900
260	5999.8	14	468	510	6167.8	116	918
270	6001.5	17	486	520	6179.8	120	936
280	6003.6	21	504	530	6192.2	124	954
290	6006.0	24	522	540	6204.9	127	972

Conversion Factors for Specific Heat at Constant Pressure (c_p)			
To Convert Tabulated Value of c_p with dimensions of $ft\ lb_F\ slug^{-1}\ °R^{-1}$	To c_p	Having Dimensions Indicated below	Multiply by
		$ft^2\ sec^{-2}\ °R^{-1}$	1.00000
		$ft\ lb_F\ lb_M^{-1}\ °R^{-1}$	0.0310810
		$ft\ lb_F\ mole_{lb}^{-1}\ °R^{-1}$	0.900293
		$Btu\ lb_M^{-1}\ °R^{-1}$	3.99680×10^{-5}
		$Btu\ mole_{lb}^{-1}\ °R^{-1}$	0.0115771

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in $ft\text{-}lb_F/slug\ °R$) for dry and moist air
(See Section 1500.3 for definition of residuals)

0.01 Atmosphere Pressure							
T (°K)	c_p	Δ	T (°R)	T (°K)	c_p	Δ	T (°R)
550	6217.8	129	990	800	6569.8	139	1440
560	6230.8	130	1008	850	6639	69	1530
570	6244.0	132	1026	900	6705	66	1620
580	6257.6	136	1044	950	6770	65	1710
590	6271.2	136	1062	1000	6830	60	1800
600	6284.9	137	1080	1050	6888	58	1890
610	6298.8	139	1098	1100	6945	57	1980
620	6312.9	141	1116	1150	7000	55	2070
630	6326.9	140	1134	1200	7053	53	2160
640	6341.2	143	1152	1250	7106	53	2250
650	6355.6	144	1170	1300	7159	53	2340
660	6370.0	144	1188	1350	7211	52	2430
670	6384.4	144	1206	1400	7264	53	2520
680	6398.9	145	1224	1450	7321	57	2610
690	6413.3	144	1242	1500	7383	62	2700
700	6427.7	144	1260	1550	7448	65	2790
710	6442.1	144	1278	1600	7518	70	2880
720	6456.4	143	1296	1650	7599	81	2970
730	6470.8	144	1314	1700	7688	89	3060
740	6485.2	144	1332	1750	7803	115	3150
750	6499.5	143	1350	1800	7951	148	3240
760	6513.5	140	1368	1850	8141	190	3330
770	6527.8	143	1386	1900	8390	249	3420
780	6541.8	140	1404	1950	8713	323	3510
790	6555.9	141	1422	2000	9142	429	3600
				2050	9732	590	3690
				2100	10490	760	3780
				2150	11360	870	3870
				2200	12380	1020	3960
				2250	13510	1130	4050
				2300	14710	1200	4140

Conversion Factors for Specific Heat at Constant Pressure (c_p)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
c_p with dimensions of ft lb_F $slug^{-1}$ $°R^{-1}$	c_p	cal gm^{-1} $°K^{-1}$	3.99680 x10-5
		cal $mole_{gm}^{-1}$ $°K^{-1}$	1.15771 $x10^{-3}$
		joule gm^{-1} $°K^{-1}$	1.67226 $x10^{-4}$
		erg gm^{-1} $°K^{-1}$	1672.26

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
	c_p	Δ	c_p Residuals, for mole % moisture content 0.1	1.0	5.0	c_p	Δ	c_p Residuals, for mole % moisture content 0.1	1.0	5.0	
90	6012.8					6076.0					162
100	6007.3	- 55				6052.8	-232				180
110	6004.1	- 32				6038.4	-144				198
120	6001.7	- 24				6028.6	- 98				216
130	6000.0	- 17				6021.6	- 70				234
140	5998.8	- 12				6016.4	- 52				252
150	5998.1	- 7				6012.8	- 36				270
160	5997.4	- 7				6009.9	- 29				288
170	5996.9	- 5				6007.7	- 22				306
180	5996.5	- 4				6005.8	- 19				324
190	5996.5	0				6004.6	- 12				342
200	5996.5	0				6003.9	- 7				360
210	5996.7	2				6003.2	- 7				378
220	5997.0	3				6002.7	- 5				396
230	5997.7	7				6002.9	2				414
240	5998.4	7				6003.0	1				432
250	5999.6	12				6003.9	9				450
260	6000.8	12				6004.8	9				468
270	6002.5	17				6006.0	12				486
280	6004.4	19				6007.7	17				504
290	6006.8	24				6009.7	20				522
300	6009.4	26				6012.1	24				540
310	6012.8	34				6015.2	31				558
320	6016.3	35				6018.5	33				576
330	6020.2	39				6022.3	38				594
340	6024.5	43				6026.4	41				612
350	6029.3	48				6031.2	48				630
360	6034.5	52				6036.3	51				648
370	6040.1	56				6041.8	55				666
380	6046.6	65				6048.4	66				684
390	5053.3	67				6054.9	65				702
400	6060.5	72				6061.9	70				720
410	6068.1	76				6069.3	74				738
420	6076.2	81				6077.5	82				756
430	6084.7	85				6086.1	86				774
440	6093.8	91				6094.9	88				792
450	6103.3	95				6104.5	96				810
460	6113.2	99				6114.3	98				828
470	6123.5	103				6124.6	103				846
480	6134.2	107				6135.0	104				864
490	6145.2	110				6146.0	110				882
500	6156.5	113	16.	33.	174.	6157.4	114	17.	32.	175.	900
510	6168.2	117				6168.9	115				918
520	9180.2	120				6180.9	120				936
530	6192.5	123				6193.2	123				954
540	6205.1	126				6205.9	127				972

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
90	6142.8					6213.7					162
100	6099.9	-429				6149.1	-646				180
110	6073.6	-263				6110.0	-391				198
120	6056.3	-173				6084.4	-256				216
130	6043.7	-126				6066.0	-184				234
140	6034.6	- 91				6052.8	-132				252
150	6027.8	- 68				6042.9	- 99				270
160	6022.6	- 52				6035.3	- 76				288
170	6018.5	- 41				6029.3	- 60				306
180	6015.2	- 33				6024.7	- 46				324
190	6012.7	- 25				6021.1	- 36				342
200	6011.1	- 16				6018.3	- 28				360
210	6009.6	- 15				6016.1	- 22				378
220	6008.5	- 11				6014.2	- 19				396
230	6008.0	- 5				6013.2	- 10				414
240	6007.7	- 3				6012.5	- 7				432
250	6008.2	5				6012.3	- 2				450
260	6008.5	3				6012.5	2				468
270	6009.6	11				6013.0	5				486
280	6010.9	13				6014.2	12				504
290	6012.8	19				6015.7	15				522
300	6015.1	23				6017.8	21				540
310	6017.8	27				6020.4	26				558
320	6020.7	29				6023.3	29				576
330	6024.5	38				6026.9	36				594
340	6028.4	39				6030.7	38				612
350	6033.1	47				6035.1	44				630
360	6038.2	51				6039.9	48				648
370	6043.6	54				6045.3	54				666
380	6049.9	63				6051.5	62				684
390	6056.4	65				6057.8	63				702
400	6063.5	71				6064.8	70				720
410	6070.7	72				6072.2	74				738
420	6078.7	80				6080.1	79				756
430	6087.3	86				6088.5	84				774
440	6096.1	88				6097.5	90				792
450	6105.5	94				6106.7	92				810
460	6115.3	98				6116.5	98				828
470	6125.6	103				6126.6	101				846
480	6136.1	105				6137.1	105				864
490	6146.9	108				6147.9	108				882
500	6158.2	113	16.	31.	174.	6159.1	112	16.	31.	173.	900
510	6169.7	115				6140.6	115				918
520	6181.7	120				6182.6	120				936
530	6193.9	122				6194.8	122				954
540	6206.6	127				6207.3	125				972

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE(c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
550	6217.9	128				6218.6	127				990
560	6231.0	131				6231.7	131				1008
570	6244.2	132				6244.9	132				1026
580	6257.8	136				6258.5	136				1044
590	6271.3	135				6272.0	135				1062
600	6285.1	138	18.	38.	183.	6285.6	136	20.	38.	185.	1080
610	6299.0	139				6299.5	139				1098
620	6313.0	140				6313.6	141				1116
630	6327.1	141				6327.6	140				1134
640	6341.4	143				6341.9	143				1152
650	6355.8	144				6356.3	144				1170
660	6370.2	144				6370.7	144				1188
670	6384.4	142				6385.0	143				1206
680	6399.0	146				6399.4	144				1224
690	6413.5	145				6413.8	144				1242
700	6427.9	144	9.	35.	190.	6428.2	144	18.	36.	192.	1260
710	6442.3	144				6442.6	144				1278
720	6456.5	142				6456.9	143				1296
730	6471.0	145				6471.3	144				1314
740	6485.4	144				6485.7	144				1332
750	6499.6	142				6500.0	143				1350
760	6513.7	141				6514.0	140				1368
770	6527.9	142				6528.1	141				1386
780	6542.0	141				6542.2	141				1404
790	6556.1	141				6556.3	141				1422
800	6570.0	139	20.	41.	202.	6570.2	139	22.	42.	205.	1440
850	6641	71				6641	71				1530
900	6705	64	16	46	209	6705	64	23	42	212	1620
950	6770	65				6770	65				1710
1000	6830	60	16	44	212	6830	60	22	40	217	1800
1050	6888	58				6888	58				1890
1100	6945	57	22	52	225	6945	57	24	46	233	1980
1150	7000	55				7000	55				2070
1200	7053	53	26	47	251	7053	53	20	44	239	2160
1250	7106	53				7106	53				2250
1300	7159	53	32	45	257	7159	53	28	47	249	2340
1350	7211	52				7211	52				2430
1400	7261	50	33	64	266	7261	50	26	60	269	2520
1450	7312	51				7312	51				2610
1500	7362	50	13	67	295	7362	50	40	55	285	2700
1550	7419	57				7417	55				2790
1600	7477	58	34	70	329	7470	53	40	68	313	2880
1650	7540	63				7530	60				2970
1700	7606	66	77	100	376	7589	59	37	86	349	3060
1750	7678	72				7650	61				3150

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
550	6219.5	129				6220.2	129				990
560	6232.4	129				6233.1	129				1008
570	6245.6	132				6246.3	132				1026
580	6259.0	134				6259.7	134				1044
590	6272.5	135				6273.2	135				1062
600	6286.1	136	19.	37.	184.	6286.8	136	19.	36.	184.	1080
610	6300.0	139				6300.7	139				1098
620	6314.1	141				6314.6	139				1116
630	6328.1	140				6328.7	141				1134
640	6342.4	143				6342.9	142				1152
650	6356.6	142				6357.2	143				1170
660	6371.1	145				6371.6	144				1188
670	6385.5	144				6386.0	144				1206
680	6399.9	144				6400.4	144				1224
690	6414.3	144				6414.7	143				1242
700	6428.7	144	22.	39.	194.	6429.1	144	23.	40.	195.	1260
710	6443.0	143				6443.3	142				1278
720	6457.2	142				6457.6	143				1296
730	6471.6	144				6472.0	144				1314
740	6486.1	145				6486.4	144				1332
750	6500.3	142				6500.7	143				1350
760	6514.4	141				6514.7	140				1368
770	6528.5	141				6528.8	141				1386
780	6542.5	140				6542.9	141				1404
790	6556.6	141				6557.0	141				1422
800	6570.5	139	23.	43.	205.	6570.9	139	24.	45.	205.	1440
850	6641	71				6641	70				1530
900	6705	64	25	43	213	6705	64	25	43	213	1620
950	6770	65				6770	65				1710
1000	6830	60	23	40	218	6830	60	23	41	218	1800
1050	6888	58				6888	58				1890
1100	6945	57	25	45	234	6945	57	26	46	236	1980
1150	7000	55				7000	55				2070
1200	7053	53	19	45	237	7053	53	21	46	238	2160
1250	7106	53				7106	53				2250
1300	7159	53	28	50	248	7159	53	28	50	248	2340
1350	7211	52				7211	52				2430
1400	7261	50	25	58	268	7261	50	25	57	268	2520
1450	7312	51				7312	51				2610
1500	7362	50	47	53	284	7362	50	48	53	283	2700
1550	7417	55				7417	55				2790
1600	7470	53	45	69	310	7470	53	45	68	306	2880
1650	7528	58				7527	57				2970
1700	7585	57	28	82	340	7583	56	27	81	336	3060
1750	7643	58				7640	57				3150

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
1800	7760	82	89	140	480	7719	69	72	112	411	3240
1850	7856	96				7791	72				3330
1900	7971	115	116	195	598	7872	81	93	145	499	3420
1950	8122	151				7970	98				3510
2000	8306	184	155	265	768	8086	116	112	193	611	3600
2050	8514	208				8212	126				3690
2100	8747	233	238	351	1050	8352	140	172	263	790	3780
2150	9060	313				8536	184				3870
2200	9432	372	315	483	1417	8745	209	219	348	1008	3960
2250	9904	472				9012	267				4050
2300	10464	560	386	648	1920	9312	300	271	438	1290	4140
2350	11082	618				9655	343				4230
2400	11830	748	514	857	2647	10057	402	354	556	1679	4320
2450	12736	906				10522	465				4410
2500	13758	1022	626	1103	3629	11078	556	419	715	2198	4500
2550	14760	1002				11650	572				4590
2600	16150	1390	695	1344	4839	12290	640	498	887	2837	4680
2650	17540	1390				12990	700				4770
2700	19070	1530	737	1503	6252	13770	780	565	1027	3631	4860
2750	20720	1650				14590	820				4950
2800	22450	1730	738	1616	7806	15480	890	596	1177	4605	5040
2850											5130
2900	25950	3500	697	1640	9085	18530	3050	618	1300	5659	5220
2950											5310
3000	29080	3130	668	1571	9794	21070	2540	606	1360	6665	5400
3100	31351	2271	630			23629	2559	590	1340	7530	5580
3200						26065	2436	560	1290	8180	5760
3300						28113	2048	530	1290	8360	5940
3400						29436	1323	570	1220	8130	6120
3500						30068	632	540	1160	7590	6300
3600						30242	174	520	1090	6730	6480
3700						30084	-158	500	1010	5900	6660
3800						30057	- 27	390	860	4960	6840
3900						30716	659	290	660	4040	7020
4000						32163	1447	290	630	3360	7200
4100						34698	2535	220	510	2640	7380
4200						38383	3685	190	470	2180	7560
4300						43055	4672	160	350	1860	7740
4400						48757	5702	160	270	1560	7920
4500						54997	6240	40	240	1330	8100
4600						61383	6386	180	240	1120	8280
4700						67861	6478	140	240	950	8460
4800						74155	6294	70	190	430	8640

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb$_F$/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
1800	7707	64	65	101	388	7702	62	62	97	378	3240
1850	7774	67				7765	63				3330
1900	7849	75	86	131	470	7837	72	80	123	452	3420
1950	7932	83				7915	78				3510
2000	8026	94	101	170	565	8002	87	95	158	540	3600
2050	8133	107				8100	98				3690
2100	8249	116	152	240	720	8206	106	142	226	682	3780
2150	8394	145				8335	129				3870
2200	8570	176	193	311	897	8491	156	178	289	836	3960
2250	8778	208				8677	186				4050
2300	9022	244	242	378	1124	8890	213	226	346	1037	2140
2350	9302	280				9133	243				4230
2400	9619	317	305	476	1433	9413	280	277	433	1306	4320
2450	9983	364				9732	319				4410
2500	10409	426	356	608	1841	10096	364	323	552	1658	4500
2550	10850	441				10500	404				4590
2600	11330	480	439	748	2341	10990	490	405	674	2089	4680
2650	11860	530				11520	530				4770
2700	12460	600	496	881	2956	12120	600	455	799	2609	4860
2750	13100	640				12790	670				4950
2800	13770	670	528	1019	3759	13510	720	488	926	3314	5040
2850						14330	820				5130
2900	16360	2590	576	1134	4595	15210	880	546	1033	4020	5220
2950						16130	920				5310
3000	18500	2140	561	1213	5452	17100	970	529	1118	4765	5400
3100	20773	2273	550	1240	6350	19135	2035	520	1160	5630	5580
3200	23092	2319	530	1230	7130	21297	2162	510	1170	6410	5760
3300	25268	2176	520	1240	7580	23430	2133	510	1190	6960	5940
3400	26977	1709	550	1180	7680	25248	1818	530	1150	7230	6120
3500	28148	1171	530	1150	7520	26660	1412	510	1120	7270	6300
3600	28890	742	510	1100	7070	27724	1064	490	1090	7060	6480
3700	29146	256	500	1070	6520	28300	576	490	1070	6710	6660
3800	29216	70	450	960	5780	28581	281	470	1000	6140	6840
3900	29576	360	370	810	5030	28962	381	420	890	5550	7020
4000	30319	743	350	760	4310	29505	543	380	830	4860	7200
4100	31754	1435	320	660	3560	30494	989	380	750	4160	7380
4200	34080	2326	270	580	2970	32170	1676	330	650	3550	7560
4300	37198	3118	210	470	2550	34473	2303	260	560	3080	7740
4400	41247	4049	220	380	2210	37599	3126	250	470	2690	7920
4500	46001	4754	110	350	1870	41439	3840	170	430	2280	8100
4600	51165	5164	200	360	1610	45760	4321	220	430	1950	8280
4700	56814	5649	150	290	1400	50681	4921	180	330	1670	8460
4800	62688	5874	160	320	1080	56005	5324	190	350	1400	8640

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
90	6213.7										162
100	6149.1	-646									180
110	6110.0	-391				6551.1					198
120	6084.4	-256				6408.3	-1428				216
130	6066.0	-184				6314.9	-934				234
140	6052.8	-132				6251.1	-638				252
150	6042.9	- 99				6204.6	-465				270
160	6035.3	- 76				6170.9	-337				288
170	6029.3	- 60				6143.8	-271				306
180	6024.7	- 46				6122.7	-211				324
190	6021.1	- 36				6106.0	-167				342
200	6018.3	- 28				6092.6	-134				360
210	6016.1	- 22				6081.8	-108				378
220	6014.2	- 19				6072.7	- 91				396
230	6013.2	- 10				6065.5	- 72				414
240	6012.5	- 7				6059.5	- 60				432
250	6012.3	- 2				6055.2	- 43				450
260	6012.5	2				6051.5	- 37				468
270	6013.0	5				6048.9	- 26				486
280	6014.2	12				6046.8	- 21				504
290	6015.7	15				6045.8	- 10				522
300	6017.8	21				6045.4	- 4				540
310	6020.4	26				6046.0	6				558
320	6023.3	29				6047.0	10				576
330	6026.9	36				6048.9	19				594
340	6030.7	38				6051.3	24				612
350	6035.1	44				6054.5	32				630
360	6039.9	48				6058.1	36				648
370	6045.3	54				6062.4	43				666
380	6051.5	62				6067.6	52				684
390	6057.8	63				6073.1	55				702
400	6064.8	70				6079.1	60				720
410	6072.2	74				6085.6	65				738
420	6080.1	79				6093.0	74				756
430	6088.5	84				6100.7	77				774
440	6097.5	90				6108.8	81				792
450	6106.7	92				6117.5	87				810
460	6116.5	98				6126.8	93				828
470	6126.6	101				6136.4	96				846
480	6137.1	105				6146.5	101				864
490	6147.9	108				6156.8	103				882
500	6159.1	112	16.	31.	173.	6167.7	109	16.	31.	167.	900
510	6140.6	115				6178.8	111				918
520	6182.6	120				6190.5	117				936
530	6194.8	122				6202.3	118				954
540	6207.3	125				6214.7	124				972

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	c_p	Δ	c_p Residuals, for mole % moisture content 0.1	1.0	5.0	c_p	Δ	c_p Residuals, for mole % moisture content 0.1	1.0	5.0	
100											180
110	7146.0					8251.0					198
120	6835.0	-3110				7424.0	-8270				216
130	6620.0	-2150				7005.0	-4190				234
140	6485.0	-1350				6761.0	-2440				252
150	6388.6	-960				6598.1	-1630				270
160	6319.4	-692				6484.9	-1132				288
170	6267.6	-518				6402.0	-829				306
180	6227.2	-404				6339.3	-627				324
190	6195.8	-314				6289.9	-494				342
200	6170.7	-251				6252.6	-373				360
210	6150.3	-204				6221.2	-314				378
220	6133.2	-171				6195.6	-566				396
230	6119.4	-138				6174.5	-211				414
240	6107.9	-115				6157.2	-173				432
250	6098.8	- 91				6143.1	-141				450
260	6090.9	- 79				6131.1	-120				468
270	6084.9	- 60				6121.5	- 96				486
280	6079.8	- 51				6113.1	- 84				504
290	6076.0	- 38				6106.5	- 66				522
300	6073.4	- 26				6101.4	- 51				540
310	6071.9	- 15				6097.8	- 36				558
320	6071.0	- 9				6094.9	- 29				576
330	6071.4	4				6093.5	- 14				594
340	6072.0	6				6093.0	- 5				612
350	6073.9	19				6093.5	5				630
360	6076.5	26				6094.7	12				648
370	6079.6	31				6096.8	21				666
380	6083.7	41				6099.7	29				684
390	6088.2	45				6103.3	36				702
400	6093.5	53				6107.8	45				720
410	6099.2	57				6112.6	48				738
420	6105.9	67				6118.4	58				756
430	6112.7	68				6124.7	63				774
440	6120.3	76				6131.6	69				792
450	6128.5	82				6139.3	77				810
460	6137.3	88				6147.6	83				828
470	6146.5	92				6156.2	86				846
480	6156.0	95				6165.4	92				864
490	6165.9	99				6175.0	96				882
500	6176.4	105	17.	32.	163.			18.	33.	159.	900
510	6187.2	108				6195.3	105				918
520	6198.4	112				6206.1	108				936
530	6210.1	117				6217.4	113				954
540	6221.9	118				6229.1	117				972

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
550	6220.2	129				6227.0	123				990
560	6233.1	129				6239.7	127				1008
570	6246.3	132				6252.6	129				1026
580	6259.7	134				6265.8	132				1044
590	6273.2	135				6279.2	134				1062
600	6286.8	136	19.	36.	184.	6292.6	134	16.	34.	182.	1080
610	6300.7	139				6306.7	141				1098
620	6314.6	139				6320.1	134				1116
630	6328.7	141				6333.8	137				1134
640	6342.9	142				6347.9	141				1152
650	6357.2	143				6362.0	141				1170
660	6371.6	144				6376.2	142				1188
670	6386.0	144				6390.5	143				1206
680	6400.4	144				6404.7	142				1224
690	6414.7	143				6418.9	142				1242
700	6429.1	144	23.	40.	195.	6433.2	143	22.	43.	195.	1260
710	6443.3	142				6447.4	142				1278
720	6457.6	143				6461.3	139				1296
730	6472.0	144				6475.8	145				1314
740	6486.4	144				6490.0	142				1332
750	6500.7	143				6504.1	141				1350
760	6514.7	140				6518.0	139				1368
770	6528.8	141				6532.1	141				1386
780	6542.9	141				6546.1	140				1404
790	6557.0	141				6560.0	139				1422
800	6570.9	139	24.	45.	205.	6573.8	138	25.	48.	205.	1440
850	6641	70				6644	70				1530
900	6705	64	25	43	213	6708	64	25	48	213	1620
950	6770	65				6773	65				1710
1000	6830	60	23	41	218	6832	59	20	43	218	1800
1050	6888	58				6890	58				1890
1100	6945	57	26	46	236	6947	57	25	47	232	1980
1150	7000	55				7002	55				2070
1200	7053	53	21	46	238	7055	53	25	48	243	2160
1250	7106	53				7108	53				2250
1300	7159	53	28	50	248	7161	53	27	50	250	2340
1350	7211	52				7213	52				2430
1400	7261	50	25	57	268	7262	49	29	55	263	2520
1450	7312	51				7314	52				2610
1500	7362	50	48	53	283	7364	50	31	56	279	2700
1550	7417	55				7415	51				2790
1600	7470	53	45	68	306	7468	53	38	62	294	2880
1650	7527	57				7522	54				2970
1700	7583	56	27	81	336	7577	55	42	77	320	3060
1750	7640	57				7631	54				3150

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure		c_p Residuals, for mole % moisture content			10.0 Atmospheres Pressure		c_p Residuals, for mole % moisture content			T (°R)
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
550	6234.1	122				6240.9	118				990
560	6246.3	122				6253.1	122				1008
570	6259.1	128				6265.5	124				1026
580	6272.2	131				6278.2	127				1044
590	6285.1	129				6290.9	127				1062
600	6298.3	132	15.	34.	182.	6303.9	130	15.	35.	182.	1080
610	6311.8	135				6317.2	133				1098
620	6325.4	136				6330.4	132				1116
630	6339.0	136				6343.8	134				1134
640	6352.9	139				6357.5	137				1152
650	6366.9	140				6371.4	139				1170
660	6380.8	139				6385.3	139				1188
670	6394.9	141				6399.2	139				1206
680	6409.0	141				6413.1	139				1224
690	6423.1	141				6427.0	139				1242
700	6437.1	140	19.	42.	192.	6441.1	141	18.	41.	192.	1260
710	6451.4	143				6455.0	139				1278
720	6465.1	137				6468.9	139				1296
730	6479.5	144				6483.0	141				1314
740	6493.6	141				6497.0	140				1332
750	6507.5	139				6511.0	140				1350
760	6521.4	139				6524.9	139				1368
770	6535.3	139				6538.8	139				1386
780	6549.2	139				6552.5	137				1404
790	6563.1	139				6566.2	137				1422
800	6576.9	138	25.	46.	205.	6580.1	139	24.	45.	205.	1440
850	6646	69				6648	68				1530
900	6710	64	24	47	213	6711	63	23	46	213	1620
950	6775	65				6777	66				1710
1000	6835	60	19	42	217	6837	60	20	42	217	1800
1050	6892	57				6893	56				1890
1100	6948	56	25	47	230	6950	57	25	47	229	1980
1150	7003	55				7005	55				2070
1200	7056	53	25	48	243	7056	51	24	48	241	2160
1250	7108	52				7110	54				2250
1300	7161	53	27	49	251	7163	53	27	48	250	2340
1350	7213	52				7214	51				2430
1400	7262	49	31	55	262	7264	50	31	54	261	2520
1450	7314	52				7314	50				2610
1500	7364	50	25	59	277	7364	50	23	59	275	2700
1550	7415	51				7415	51				2790
1600	7468	53	33	59	288	7468	53	32	59	286	2880
1650	7522	54				7522	54				2970
1700	7575	53	48	74	314	7577	55	51	74	312	3060
1750	7630	55				7630	53				3150

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
1800	7702	62	62	97	378	7690	59	54	91	352	3240
1850	7765	63				7746	56				3330
1900	7837	72	80	123	452	7808	62	59	103	398	3420
1950	7915	78				7872	64				3510
2000	8002	87	95	158	540	7940	68	81	130	463	3600
2050	8100	98				8016	76				3690
2100	8206	106	142	226	682	8093	77	109	176	564	3780
2150	8335	129				8182	89				3870
2200	8491	156	178	289	836	8279	97	130	209	657	3960
2250	8677	186				8394	115				4050
2300	8890	213	226	346	1037	8529	135	166	254	789	4140
2350	9133	243				8679	148				4230
2400	9413	280	277	433	1306	8838	161	198	318	957	4320
2450	9732	319				9020	182				4410
2500	10096	364	323	552	1658	9223	203	238	392	1171	4500
2550	10500	404				9453	230				4590
2600	10990	490	405	674	2089	9717	264	294	466	1417	4680
2650	11520	530				10009	292				4770
2700	12120	600	455	799	2609	10331	322	324	551	1695	4860
2750	12790	670				10723	392				4950
2800	13510	720	488	926	3314	11080	357	366	641	2093	5040
2850	14330	820				11514	434				5130
2900	15210	880	546	1033	4020	12003	489	410	714	2453	5220
2950	16130	920				12513	510				5310
3000	17100	970	529	1118	4765	13054	541	416	796	2859	5400
3100	19135	2035	520	1160	5630	14313	1259	430	870	3410	5580
3200	21297	2162	510	1170	6410	15710	1397	430	910	3970	5760
3300	23430	2133	510	1190	6960	17252	1542	440	950	4520	5940
3400	25248	1818	530	1150	7230	18826	1574	440	960	5050	6120
3500	26660	1412	510	1120	7270	20409	1583	420	950	5470	6300
3600	27724	1064	490	1090	7060	21990	1581	410	950	5820	6480
3700	28300	576	490	1070	6710	23363	1373	420	960	6040	6660
3800	28581	281	470	1000	6140	24463	1100	460	970	6100	6840
3900	28962	381	420	890	5550	25412	949	450	960	6090	7020
4000	29505	543	380	830	4860	26113	701	420	930	5810	7200
4100	30494	989	380	750	4160	26700	587	470	910	5530	7380
4200	32170	1676	330	650	3550	27315	615	450	850	5210	7560
4300	34473	2303	260	560	3080	28004	689	390	820	4750	7740
4400	37599	3126	250	470	2690	29010	1006	330	760	4360	7920
4500	41439	3840	170	430	2280	30368	1358	340	700	3880	8100
4600	45760	4321	220	430	1950	32067	1699	310	650	3430	8280
4700	50681	4921	180	330	1670	34224	2157	300	590	3000	8460
4800	56005	5324	190	350	1400	36929	2705	260	460	2660	8640

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
1800	7688	58	53	90	347	7686	56	51	89	345	3240
1850	7743	55				7740	54				3330
1900	7800	57	53	98	380	7798	58	50	95	372	3420
1950	7861	61				7856	58				3510
2000	7925	64	76	124	440	7918	62	71	118	425	3600
2050	7994	69				7985	67				3690
2100	8066	72	99	158	527	8054	69	93	147	505	3780
2150	8143	77				8126	72				3870
2200	8224	81	115	183	604	8205	79	108	170	577	3960
2250	8325	101				8296	91				4050
2300	8442	117	145	228	718	8399	103	132	214	678	4140
2350	8565	123				8507	108				4230
2400	8697	132	176	285	859	8627	120	164	267	806	4320
2450	8843	146				8757	130				4410
2500	9006	163	217	347	1039	8902	145	205	322	967	4500
2550	9188	182				9066	164				4590
2600	9396	208	258	410	1239	9250	184	238	379	1143	4680
2650	9624	228				9451	201				4770
2700	9875	251	285	478	1461	9671	220	263	438	1336	4860
2750	10148	273				9913	242				4950
2800	10450	302	329	556	1766	10179	266	308	511	1595	5040
2850	10783	333				10481	302				5130
2900	11152	369	359	523	2063	10814	333	329	573	1865	5220
2950	11557	405				11171	357				5310
3000	12000	443	376	696	2396	11542	371	354	641	2165	5400
3100	13023	1023	390	760	2820	12361	819	370	700	2530	5580
3200	14148	1125	400	800	3270	13337	976	380	740	2900	5760
3300	15409	1261	400	850	3740	14432	1095	380	780	3310	5940
3400	16732	1323	410	870	4200	15588	1156	380	820	3710	6120
3500	18130	1398	390	870	4620	16833	1245	360	820	4110	6300
3600	19592	1462	380	880	5030	18161	1328	360	830	4510	6480
3700	20967	1375	390	890	5340	19458	1297	380	840	4840	6660
3800	22174	1207	420	890	5550	20656	1198	390	840	5110	6840
3900	23288	1114	410	900	5660	21816	1160	370	850	5260	7020
4000	24172	884	400	890	5570	22789	973	380	850	5300	7200
4100	24916	744	440	890	5490	23649	860	410	860	5310	7380
4200	25568	652	450	860	5370	24384	735	430	850	5310	7560
4300	26179	611	410	850	5030	25041	657	410	840	5070	7740
4400	26949	770	350	820	4730	25783	742	360	840	4850	7920
4500	27876	927	370	760	4360	26576	793	380	780	4570	8100
4600	29011	1135	350	710	4000	27496	920	370	730	4240	8280
4700	30437	1426	340	680	3610	28604	1108	360	730	3950	8460
4800	32299	1862	290	540	3230	30056	1452	310	590	3570	8640

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb$_F$/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
	c_p	Δ	c_p Residuals, for mole % moisture content 0.1	1.0	5.0	c_p	Δ	c_p Residuals, or mole % moisture content 0.1	1.0	5.0	
100											180
110	8251.0										198
120	7424.0	-8270									216
130	7005.0	-4190									234
140	6761.0	-2440									252
150	6598.1	-1630									270
160	6484.9	-1130				10086					288
170	6402.0	-829				8740	-1346				306
180	6339.3	-627				8035	-705				324
190	6289.9	-494				7597	-438				342
200	6252.6	-373				7305	-292				360
210	6221.2	-314				7087	-218				378
220	6195.6	-566				6928	-159				396
230	6174.5	-211				6802	-126				414
240	6157.2	-173				6705	- 97				432
250	6143.1	-141				6626	- 79				450
260	6131.1	-120				6560	- 66				468
270	6121.5	- 96				6505	- 55				486
280	6113.1	- 84				6459	- 46				504
290	6106.5	- 66				6421	- 38				522
300	6101.4	- 51				6389	- 32				540
310	6097.8	- 36				6361	- 28				558
320	6094.9	- 29				6337	- 24				576
330	6093.5	- 14				6317	- 20				594
340	6093.0	- 5				6301	- 16				612
350	6093.5	5				6286	- 15				630
360	6094.7	12				6275	- 11				648
370	6096.8	21				6265	- 10				666
380	6099.7	29				6258	- 7				684
390	6103.3	36				6251	- 7				702
400	6107.8	45				6248	- 3				720
410	6112.6	48				6245	- 3				738
420	6118.4	58				6243	- 2				756
430	6124.7	63				6243	0				774
440	6131.6	69				6243	0				792
450	6139.3	77				6245	2				810
460	6147.6	83				6248	3				828
470	6156.2	86				6251	3				846
480	6165.4	92				6257	6				864
490	6175.0	96				6262	5				882
500	6184.8	98	18.	33.	159.	6269	7	15	26	119	900
510	6195.3	105				6275	6				918
520	6206.1	108				6282	7				936
530	6217.4	113				6291	9				954
540	6229.1	117				6299	8				972

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
100											180
110											198
120											216
130											234
140											252
150											270
160											288
170											306
180	11365					14520					324
190	9708	-1657				11980	-2540				342
200	8809	-899				10434	-1550				360
210	8222	-587				9403	-1030				378
220	7825	-397				8742	-661				396
230	7539	-286				8275	-467				414
240	7321	-218				7928	-347				432
250	7151	-170				7661	-267				450
260	7020	-131				7456	-205				468
270	6909	-111				7292	-164				486
280	6814	- 95				7153	-139				504
290	6739	- 75				7039	-114				522
300	6675	- 64				6945	- 94				540
310	6620	- 55				6866	- 79				558
320	6576	- 44				6797	- 69				576
330	6536	- 40				6741	- 56				594
340	6502	- 34				6689	- 52				612
350	6473	- 29				6646	- 43				630
360	6447	- 26				6607	- 39				648
370	6427	- 20				6576	- 31				666
380	6406	- 21				6547	- 29				684
390	6392	- 14				6523	- 24				702
400	6380	- 12				6502	- 21				720
410	6368	- 12				6483	- 19				738
420	6360	- 8				6468	- 15				756
430	6353	- 7				6456	- 12				774
440	6348	- 5				6445	- 11				792
450	6344	- 4				6437	- 8				810
460	6342	- 2				6430	- 7				828
470	6342	0				6425	- 5				846
480	6342	0				6421	- 4				864
490	6342	0				6420	- 1				882
500	6346	4				6418	- 2				900
510	6349	3				6418	0				918
520	6353	4				6420	2				936
530	6358	5				6421	1				954
540	6365	7				6425	4				972

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
550	6240.9	118				6308	9				990
560	6253.1	122				6317	9				1008
570	6265.5	124				6327	10				1026
580	6278.2	127				6337	10				1044
590	6290.9	127				6348	11				1062
600	6303.9	130	15.	35.	182.	6360	12	16	35	181	1080
610	6317.2	133				6370	10				1098
620	6330.4	132				6382	12				1116
630	6343.8	134				6394	12				1134
640	6357.5	137				6406	12				1152
650	6371.4	139				6418	12				1170
660	6385.3	139				6430	12				1188
670	6399.2	139				6442	12				1206
680	6413.1	139				6454	12				1224
690	6427.0	139				6468	14				1242
700	6441.1	141	18.	41.	192.	6480	12	19	38	189	1260
710	6455.0	139				6493	13				1278
720	6468.9	139				6505	12				1296
730	6483.0	141				6519	14				1314
740	6497.0	140				6531	12				1332
750	6511.0	140				6545	14				1350
760	6524.9	139				6557	12				1368
770	6538.8	139				6571	14				1386
780	6552.5	137				6583	12				1404
790	6566.2	137				6596	13				1422
800	6580.1	139	24.	45.	205.	6610	14	20	38	204	1440
850	6648	68				6677	67				1530
900	6711	63	23	46	213	6735	58	21	37	211	1620
950	6777	66				6797	62				1710
1000	6837	60	20	42	217	6854	57	26	39	218	1800
1050	6893	56				6909	55				1890
1100	6950	57	25	47	229	6964	55	25	43	227	1980
1150	7005	55				7017	53				2070
1200	7056	51	24	48	241	7068	51	17	46	230	2160
1250	7110	54				7120	52				2250
1300	7163	53	27	48	250	7173	53	24	45	246	2340
1350	7214	51				7223	50				2430
1400	7264	50	31	54	261	7271	48	25	51	260	2520
1450	7314	50				7323	52				2610
1500	7364	50	23	59	275	7371	48	36	59	272	2700
1550	7415	51				7422	51				2790
1600	7468	53	32	59	286	7474	52	34	65	283	2880
1650	7522	54				7527	53				2970
1700	7577	55	51	74	312	7580	53	32	66	301	3060
1750	7630	53				7633	53				3150

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
550	6370	5				6428	3				990
560	6377	7				6433	5				1008
570	6385	8				6439	6				1026
580	6392	7				6445	6				1044
590	6401	9				6451	6				1062
600	6411	10				6459	8				1080
610	6420	9				6466	7				1098
620	6430	10				6475	9				1116
630	6439	9				6483	8				1134
640	6449	10				6492	9				1152
650	6461	12				6500	8				1170
660	6471	10				6511	11				1188
670	6483	12				6521	10				1206
680	6493	10				6529	8				1224
690	6505	12				6540	11				1242
700	6517	12				6552	12				1260
710	6528	11				6562	10				1278
720	6540	12				6572	10				1296
730	6552	12				6583	11				1314
740	6564	12				6595	12				1332
750	6576	12				6605	10				1350
760	6588	12				6615	10				1368
770	6600	12				6627	12				1386
780	6612	12				6639	12				1404
790	6624	12				6650	11				1422
800	6638	14	20	42	203	6663	13				1440
850	6698	60				6720	57				1530
900	6756	58	21	38	209	6775	55				1620
950	6814	58				6832	57				1710
1000	6871	57	26	40	216	6887	55				1800
1050	6924	53				6938	51				1890
1100	6977	53	24	42	226	6990	52	23	45	226	1980
1150	7029	52				7043	53				2070
1200	7080	51	18	46	230	7089	46	22	45	234	2160
1250	7130	50				7139	50				2250
1300	7182	52	26	49	247	7190	51	28	54	250	2340
1350	7230	50				7238	48				2430
1400	7280	48	22	50	259	7286	48	23	50	258	2520
1450	7329	49				7335	49				2610
1500	7377	48	41	56	271	7384	49	40	55	271	2700
1550	7427	50				7434	50				2790
1600	7479	52	37	67	282	7486	52	36	67	281	2880
1650	7532	53				7537	51				2970
1700	7585	53	23	64	298	7589	52	22	64	296	3060
1750	7637	52				7640	51				3150

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
1800	7686	56	51	89	345	7685	52	41	72	328	3240
1850	7740	54				7738	53				3330
1900	7798	58	50	95	372	7793	55	51	85	349	3420
1950	7856	58				7846	53				3510
2000	7918	62	71	118	425	7901	55	49	94	378	3600
2050	7985	67				7961	60				3690
2100	8054	69	93	147	505	8023	62	72	119	439	3780
2150	8126	72				8083	60				3870
2200	8205	79	108	170	577	8145	62	90	145	499	3960
2250	8296	91				8213	68				4050
2300	8399	103	132	214	678	8287	74	101	172	557	4140
2350	8507	108				8366	79				4230
2400	8627	120	164	267	806	8449	83	129	204	642	4320
2450	8757	130				8536	87				4410
2500	8902	145	205	322	967	8630	94	161	247	754	4500
2550	9066	164				8732	102				4590
2600	9250	184	238	379	1143	8843	111	178	282	864	4680
2650	9451	201				8960	117				4770
2700	9671	220	263	438	1336	9089	129	196	320	982	4860
2750	9913	242				9230	141				4950
2800	10179	266	308	511	1595	9384	154	223	373	1136	5040
2850	10481	302				9549	165				5130
2900	10814	333	329	573	1865	9729	180	258	429	1322	5220
2950	11171	357				9925	196				5310
3000	11542	371	354	641	2165	10138	213	275	469	1511	5400
3100	12361	819	370	700	2530	10609	471	290	510	1710	5580
3200	13337	976	380	740	2900	11151	542	300	540	1930	5760
3300	14432	1095	380	780	3310	11771	620	300	580	2160	5940
3400	15588	1156	380	820	3710	12417	646	310	620	2350	6120
3500	16833	1245	360	820	4110	13112	695	300	630	2590	6300
3600	18161	1328	360	830	4510	13877	765	300	650	2850	6480
3700	19458	1297	380	840	4840	14682	805	310	660	3090	6660
3800	20656	1198	390	840	5110	15527	845	290	660	3380	6840
3900	21816	1160	370	850	5260	16473	946	270	650	3560	7020
4000	22789	973	380	850	5300	17407	934	300	650	3780	7200
4100	23649	860	410	860	5310	18394	987	290	690	4000	7380
4200	24384	735	430	850	5310	19342	948	310	700	4230	7560
4300	25041	657	410	840	5070	20232	890	320	700	4320	7740
4400	25783	742	360	840	4850	21124	892	320	720	4420	7920
4500	26576	793	380	780	4570	21902	778	340	730	4450	8100
4600	27496	920	370	730	4240	22639	737	360	720	4420	8280
4700	28604	1108	360	730	3950	23345	706	340	720	4450	8460
4800	30056	1452	310	590	3570	24080	735	350	710	4250	8640

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			c_p Residuals, for mole % moisture content					c_p Residuals, for mole % moisture content			
	c_p	Δ	0.1	1.0	5.0	c_p	Δ	0.1	1.0	5.0	
1800	7688	51	36	65	319	7692	52	35	63	315	3240
1850	7740	52				7743	51				3330
1900	7793	53	53	82	345	7796	53	53	80	341	3420
1950	7848	55				7849	53				3510
2000	7903	55	41	84	364	7904	55	39	80	358	3600
2050	7959	56				7961	57				3690
2100	8016	57	64	113	419	8018	57	60	109	408	3780
2150	8073	57				8071	53				3870
2200	8133	60	86	143	475	8126	55	82	140	460	3960
2250	8196	63				8186	60				4050
2300	8263	67	95	158	521	8249	63	94	151	501	4140
2350	8334	71				8316	67				4230
2400	8406	72	120	183	595	8387	71	113	170	570	4320
2450	8481	75				8459	72				4410
2500	8560	79	140	222	688	8533	74	127	207	652	4500
2550	8644	84				8610	77				4590
2600	8733	89	162	249	783	8689	79	153	230	738	4680
2650	8828	95				8780	91				4770
2700	8931	103	176	285	879	8878	98	165	266	825	4860
2750	9046	115				8982	104				4950
2800	9168	122	191	332	1021	9092	110	172	308	960	5040
2850	9296	128				9205	113				5130
2900	9434	138	245	381	1157	9327	122	237	353	1062	5220
2950	9583	149				9461	134				5310
3000	9746	163	247	411	1286	9616	155	229	378	1154	5400
3100	10135	389	250	460	1450	9882	266	230	420	1300	5580
3200	10546	411	280	500	1650	10220	338	260	470	1480	5760
3300	11045	499	290	520	1840	10655	435	280	490	1660	5940
3400	11582	537	290	550	2030	11143	488	270	510	1860	6120
3500	12157	575	280	560	2230	11674	531	270	520	2050	6300
3600	12809	652	280	580	2440	12292	618	260	540	2250	6480
3700	13484	675	280	600	2630	12923	631	260	560	2420	6660
3800	14180	696	270	610	2870	13549	626	270	590	2640	6840
3900	14946	766	270	600	3070	14206	657	270	590	2850	7020
4000	15700	754	280	580	3230	14826	620	260	550	2940	7200
4100	16520	820	270	630	3450	15492	666	280	590	3140	7380
4200	17350	830	270	630	3620	16186	694	250	580	3250	7560
4300	18150	800	270	620	3770	16860	674	240	580	3410	7740
4400	18982	832	280	630	3930	17590	730	260	570	3590	7920
4500	19754	772	300	660	4000	18312	722	280	600	3690	8100
4600	20495	741	320	670	4050	19028	716	290	630	3710	8280
4700	21216	721	310	650	4130	19751	723	280	590	3790	8460
4800	21925	709	340	680	4070	20465	714	320	620	3820	8640

Table 1510.07 SPECIFIC HEAT AT CONSTANT PRESSURE (c_p in ft-lb_F/slug °R) for dry and moist air (Concluded)
(See Section 1500.3 for definition of residuals)

1510.08 Ratio of Specific Heats

0.01 Atmosphere Pressure							
T (°K)	γ	Δ	T (°R)	T (°K)	γ	Δ	T (°R)
50	1.4048		90	300	1.4000	- 2	540
60	1.4031	- 17	108	310	1.3997	- 3	558
70	1.4023	- 8	126	320	1.3993	- 4	576
80	1.4019	- 4	144	330	1.3990	- 3	594
90	1.4017	- 2	162	340	1.3986	- 4	612
100	1.4016	- 1	180	350	1.3981	- 5	630
110	1.4015	- 1	198	360	1.3976	- 5	648
120	1.4015	0	216	370	1.3970	- 6	666
130	1.4015	0	234	380	1.3964	- 6	684
140	1.4015	0	252	390	1.3958	- 6	702
150	1.4014	- 1	270	400	1.3952	- 6	720
160	1.4014	0	288	410	1.3945	- 7	738
170	1.4014	0	306	420	1.3937	- 8	756
180	1.4014	0	324	430	1.3930	- 7	774
190	1.4013	- 1	342	440	1.3922	- 8	792
200	1.4013	0	360	450	1.3913	- 9	810
210	1.4013	0	378	460	1.3904	- 9	828
220	1.4012	- 1	396	470	1.3895	- 9	846
230	1.4011	- 1	414	480	1.3886	- 9	864
240	1.4011	0	432	490	1.3876	- 10	882
250	1.4009	- 2	450	500	1.3866	- 10	900
260	1.4008	- 1	468	510	1.3856	- 10	918
270	1.4006	- 2	486	520	1.3846	- 10	936
280	1.4004	- 2	504	530	1.3835	- 11	954
290	1.4002	- 2	522	540	1.3824	- 11	972

Moisture residuals at 300°K(540°R)

Mole % moisture content	0.5	1.0	5.0
γ Residuals	0.003	0.002	-0.005

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air
(See Section 1500.3 for definition of residuals)

0.01 Atmosphere Pressure							
T (°K)	γ	Δ	T (°R)	T (°K)	γ	Δ	T (°R)
550	1.3812	- 11	990	800	1.3537	- 10	1440
560	1.3802	- 11	1008	850	1.3492	- 45	1530
570	1.3791	- 11	1026	900	1.3444	- 48	1620
580	1.3780	- 11	1044	950	1.340	- 4	1710
590	1.3769	- 11	1062	1000	1.336	- 4	1800
600	1.3757	- 12	1080	1050	1.332	- 4	1890
610	1.3746	- 11	1098	1100	1.329	- 3	1980
620	1.3734	- 12	1116	1150	1.325	- 4	2070
630	1.3723	- 11	1134	1200	1.322	- 3	2160
640	1.3712	- 11	1152	1250	1.319	- 3	2250
650	1.3700	- 12	1170	1300	1.316	- 3	2340
660	1.3689	- 11	1188	1350	1.313	- 3	2430
670	1.3677	- 12	1206	1400	1.310	- 3	2520
680	1.3666	- 11	1224	1450	1.307	- 3	2610
690	1.3655	- 11	1242	1500	1.304	- 3	2700
700	1.3643	- 12	1260	1550	1.301	- 3	2790
710	1.3632	- 11	1278	1600	1.298	- 3	2880
720	1.3621	- 11	1296	1650	1.294	- 4	2970
730	1.3610	- 11	1314	1700	1.290	- 4	3060
740	1.3598	- 11	1332	1750	1.285	- 5	3150
750	1.3589	- 10	1350	1800	1.280	- 5	3240
760	1.3578	- 11	1368	1850	1.273	- 7	3330
770	1.3568	- 10	1386	1900	1.266	- 7	3420
780	1.3557	- 11	1404	1950	1.255	-11	3510
790	1.3547	- 10	1422	2000	1.243	-12	3600
				2050	1.233	-10	3690
				2100	1.223	-10	3780

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
80	1.4058										144
90	1.4046	- 12				1.4139					162
100	1.4038	- 8				1.4108	- 31				180
110	1.4032	- 6				1.4087	- 21				198
120	1.4029	- 3				1.4073	- 14				216
130	1.4026	- 3				1.4063	- 10				234
140	1.4024	- 2				1.4055	- 8				252
150	1.4022	- 2				1.4049	- 6				270
160	1.4021	- 1				1.4044	- 5				288
170	1.4020	- 1				1.4040	- 4				306
180	1.4019	- 1				1.4036	- 4				324
190	1.4018	- 1				1.4033	- 3				342
200	1.4017	- 1				1.4030	- 3				360
210	1.4016	- 1				1.4028	- 2				378
220	1.4015	- 1				1.4026	- 2				396
230	1.4014	- 1				1.4024	- 2				414
240	1.4013	- 1				1.4022	- 2				432
250	1.4011	- 2				1.4020	- 2				450
260	1.4010	- 1				1.4017	- 3				468
270	1.4008	- 2				1.4014	- 3				486
280	1.4006	- 2				1.4012	- 2				504
290	1.4004	- 2				1.4009	- 3				522
300	1.4001	- 3	.000	.002	-.002	1.4006	- 3	.000	.001	-.003	540
310	1.3998	- 3				1.4003	- 3				558
320	1.3995	- 3				1.4000	- 3				576
330	1.3991	- 4				1.3995	- 5				594
340	1.3987	- 4				1.3990	- 5				612
350	1.3982	- 5				1.3985	- 5				630
360	1.3977	- 5				1.3980	- 5				648
370	1.3972	- 5				1.3975	- 5				666
380	1.3966	- 6				1.3969	- 6				684
390	1.3960	- 6				1.3962	- 7				702
400	1.3953	- 7	.000	.001	-.003	1.3956	- 6	.000	.001	-.003	720
410	1.3946	- 7				1.3948	- 8				738
420	1.3938	- 8				1.3941	- 7				756
430	1.3931	- 7				1.3933	- 8				774
440	1.3923	- 8				1.3925	- 8				792
450	1.3914	- 9				1.3916	- 9				810
460	1.3905	- 9				1.3907	- 9				828
470	1.3896	- 9				1.3898	- 9				846
480	1.3887	- 9				1.3887	- 11				864
490	1.3877	- 10				1.3878	- 9				882
500	1.3867	- 10	.000	.000	-.004	1.3868	- 10	.000	-.000	-.004	900
510	1.3857	- 10				1.3858	- 10				918
520	1.3846	- 11				1.3847	- 11				936
530	1.3836	- 10				1.3837	- 10				954
540	1.3825	- 11				1.3826	- 11				972

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
90	1.4237										162
100	1.4182	- 55									180
110	1.4144	- 38				1.4202					198
120	1.4119	- 25				1.4166	- 36				216
130	1.4101	- 18				1.4139	- 27				234
140	1.4087	- 14				1.4119	- 20				252
150	1.4076	- 11				1.4102	- 17				270
160	1.4067	- 9				1.4089	- 13				288
170	1.4060	- 7				1.4079	- 10				306
180	1.4054	- 6				1.4071	- 8				324
190	1.4048	- 6				1.4064	- 7				342
200	1.4043	- 5				1.4057	- 7				360
210	1.4040	- 3				1.4053	- 4				378
220	1.4037	- 3				1.4048	- 5				396
230	1.4034	- 3				1.4044	- 4				414
240	1.4031	- 3				1.4040	- 4				432
250	1.4028	- 3				1.4036	- 4				450
260	1.4024	- 4				1.4032	- 4				468
270	1.4022	- 2				1.4029	- 3				486
280	1.4018	- 4				1.4024	- 5				504
290	1.4015	- 3				1.4020	- 4				522
300	1.4012	- 3	.000	.000	-.003	1.4017	- 3	.000	-.001	-.004	540
310	1.4008	- 4				1.4013	- 4				558
320	1.4004	- 4				1.4008	- 5				576
330	1.3999	- 5				1.4004	- 4				594
340	1.3994	- 5				1.3999	- 5				612
350	1.3989	- 5				1.3993	- 6				630
360	1.3984	- 5				1.3987	- 6				648
370	1.3978	- 6				1.3981	- 6				666
380	1.3972	- 6				1.3975	- 6				684
390	1.3965	- 7				1.3968	- 7				702
400	1.3958	- 7	.000	-.000	-.004	1.3961	- 7	.000	-.001	-.004	720
410	1.3951	- 7				1.3953	- 8				738
420	1.3943	- 8				1.3946	- 7				756
430	1.3935	- 8				1.3938	- 8				774
440	1.3927	- 8				1.3929	- 9				792
450	1.3918	- 9				1.3920	- 9				810
460	1.3909	- 9				1.3911	- 9				828
470	1.3900	- 9				1.3901	- 10				846
480	1.3890	- 10				1.3892	- 9				864
490	1.3880	- 10				1.3881	- 11				882
500	1.3870	- 10	.000	-.000	-.004	1.3871	- 10	.000	-.001	-.004	900
510	1.3859	- 11				1.3861	- 10				918
520	1.3849	- 10				1.3851	- 10				936
530	1.3838	- 11				1.3840	- 11				954
540	1.3828	- 10				1.3829	- 11				972

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
550	1.3814	- 11				1.3815	- 11				990
560	1.3803	- 11				1.3804	- 11				1008
570	1.3792	- 11				1.3793	- 11				1026
580	1.3780	- 12				1.3781	- 12				1044
590	1.3769	- 11				1.3770	- 11				1062
600	1.3758	- 11	-.001	-.001	-.005	1.3758	- 12	-.000	-.001	-.005	1080
610	1.3746	- 12				1.3747	- 11				1098
620	1.3735	- 11				1.3735	- 12				1116
630	1.3723	- 12				1.3724	- 11				1134
640	1.3712	- 11				1.3713	- 11				1152
650	1.3700	- 12				1.3701	- 12				1170
660	1.3689	- 11				1.3690	- 11				1188
670	1.3677	- 12				1.3678	- 12				1206
680	1.3666	- 11				1.3666	- 12				1224
690	1.3655	- 11				1.3655	- 11				1242
700	1.3644	- 11	.000	-.002	-.005	1.3644	- 11	-.001	-.001	-.005	1260
710	1.3633	- 11				1.3633	- 11				1278
720	1.3622	- 11				1.3622	- 11				1296
730	1.3611	- 11				1.3611	- 11				1314
740	1.3600	- 11				1.3600	- 11				1332
750	1.3589	- 11				1.3589	- 11				1350
760	1.3579	- 10				1.3579	- 10				1368
770	1.3568	- 11				1.3568	- 11				1386
780	1.3558	- 10				1.3557	- 11				1404
790	1.3547	- 11				1.3548	- 9				1422
800	1.3537	- 10	-.001	-.001	-.005	1.3537	- 11	-.000	-.001	-.005	1440
850	1.3492	- 45				1.349	- 5				1530
900	1.3444	- 48	.000	-.001	-.005	1.344	- 5	.000	-.001	-.005	1620
950	1.340	- 4				1.340	- 4				1710
1000	1.336	- 4	-.001	-.001	-.006	1.336	- 4	-.000	-.002	-.006	1800
1050	1.332	- 4				1.332	- 4				1890
1100	1.329	- 3	-.001	-.002	-.006	1.329	- 3	-.001	-.002	-.006	1980
1150	1.325	- 4				1.325	- 4				2070
1200	1.322	- 3	-.001	-.002	-.007	1.322	- 3	-.001	-.002	-.006	2160
1250	1.319	- 3				1.319	- 3				2250
1300	1.316	- 3	-.001	-.002	-.007	1.316	- 3	-.001	-.001	-.006	2340
1350	1.313	- 3				1.313	- 3				2430
1400	1.310	- 3	-.001	-.001	-.006	1.310	- 3	-.001	-.001	-.006	2520
1450	1.307	- 3				1.307	- 3				2610
1500	1.304	- 3	-.002	-.001	-.008	1.304	- 3	-.000	-.001	-.007	2700
1550	1.302	- 2				1.302	- 2				2790
1600	1.299	- 3	-.002	-.003	-.008	1.299	- 3	-.002	-.003	-.008	2880
1650	1.296	- 3				1.296	- 3				2970
1700	1.292	- 4	-.000	-.002	-.010	1.293	- 3	-.003	-.004	-.010	3060
1750	1.289	- 3				1.290	- 3				3150

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
550	1.3817	- 11				1.3818	- 11				990
560	1.3805	- 12				1.3806	- 12				1008
570	1.3794	- 11				1.3795	- 11				1026
580	1.3782	- 12				1.3783	- 12				1044
590	1.3771	- 11				1.3782	- 11				1062
600	1.3759	- 12	.000	-.001	-.005	1.3760	- 12	.000	-.001	-.005	1080
610	1.3748	- 11				1.3749	- 11				1098
620	1.3737	- 11				1.3737	- 12				1116
630	1.3725	- 12				1.3726	- 11				1134
640	1.3714	- 11				1.3714	- 12				1152
650	1.3702	- 12				1.3702	- 12				1170
660	1.3690	- 12				1.3691	- 11				1188
670	1.3679	- 11				1.3679	- 12				1206
680	1.3668	- 11				1.3668	- 11				1224
690	1.3656	- 12				1.3657	- 11				1242
700	1.3645	- 11	-.001	-.001	-.005	1.3646	- 11	-.001	-.001	-.005	1260
710	1.3634	- 11				1.3634	- 12				1278
720	1.3623	- 11				1.3623	- 11				1296
730	1.3612	- 11				1.3612	- 11				1314
740	1.3601	- 11				1.3601	- 11				1332
750	1.3590	- 11				1.3591	- 10				1350
760	1.3580	- 10				1.3580	- 11				1368
770	1.3569	- 11				1.3569	- 11				1386
780	1.3558	- 11				1.3559	- 10				1404
790	1.3548	- 10				1.3549	- 10				1422
800	1.3538	- 10	.000	-.001	-.005	1.3538	- 11	.000	-.001	-.005	1440
850	1.349	- 5				1.349	- 5				1530
900	1.344	- 5	.000	-.001	-.005	1.345	- 4	.000	-.001	-.005	1620
950	1.340	- 4				1.340	- 5				1710
1000	1.336	- 4	-.000	-.002	-.006	1.336	- 4	.000	-.002	-.006	1800
1050	1.332	- 4				1.332	- 4				1890
1100	1.329	- 3	-.001	-.002	-.006	1.329	- 3	-.001	-.002	-.006	1980
1150	1.325	- 4				1.325	- 4				2070
1200	1.322	- 3	-.001	-.002	-.006	1.322	- 3	-.001	-.002	-.006	2160
1250	1.319	- 3				1.319	- 3				2250
1300	1.316	- 3	-.001	-.001	-.006	1.316	- 3	-.001	-.001	-.006	2340
1350	1.313	- 3				1.313	- 3				2430
1400	1.310	- 3	-.001	-.001	-.006	1.310	- 3	-.001	-.001	-.006	2520
1450	1.307	- 3				1.307	- 3				2610
1500	1.304	- 3	.000	-.001	-.006	1.304	- 3	.000	-.001	-.006	2700
1550	1.302	- 2				1.301	- 3				2790
1600	1.299	- 3	-.001	-.002	-.008	1.299	- 2	-.001	-.002	-.008	2880
1650	1.296	- 3				1.296	- 3				2970
1700	1.293	- 3	-.003	-.004	-.010	1.293	- 3	-.003	-.004	-.009	3060
1750	1.291	- 2				1.291	- 2				3150

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
1800	1.286	- 3	-.002	-.004	-.013	1.287	- 3	-.002	-.004	-.012	3240
1850	1.282	- 4				1.284	- 3				3330
1900	1.277	- 5	-.004	-.006	-.016	1.281	- 3	-.003	-.005	-.014	3420
1950	1.272	- 5				1.277	- 4				3510
2000	1.266	- 6	-.005	-.006	-.018	1.272	- 5	-.004	-.005	-.014	3600
2050	1.260	- 6				1.268	- 4				3690
2100	1.254	- 6	-.006	-.009	-.022	1.263	- 5	-.004	-.007	-.017	3780
2150	1.247	- 7				1.258	- 5				3870
2200	1.239	- 8	-.007	-.009	-.023	1.253	- 5	-.005	-.007	-.018	3960
2250	1.231	- 8				1.248	- 5				4050
2300	1.222	- 9	-.006	-.008	-.023	1.243	- 5	-.006	-.008	-.022	4140
2350	1.214	- 8				1.236	- 7				4230
2400	1.206	- 8	-.007	-.009	-.024	1.229	- 7	-.006	-.009	-.023	4320
2450	1.198	- 8				1.221	- 8				4410
2500	1.190	- 8	-.004	-.007	-.019	1.214	- 7	-.005	-.008	-.021	4500
2550	1.184	- 6				1.207	- 7				4590
2600	1.178	- 6	-.003	-.005	-.015	1.201	- 6	-.004	-.006	-.019	4680
2650	1.174	- 4				1.196	- 5				4770
2700	1.171	- 3	-.002	-.004	-.010	1.191	- 5	-.003	-.006	-.016	4860
2750	1.169	- 2				1.187	- 4				4950
2800	1.168	- 1	-.000	-.002	-.005	1.184	- 3	-.003	-.005	-.013	5040
2850	1.168	0				1.181	- 3				5130
2900	1.169	1	-.000	.001	.000	1.179	- 2	-.001	-.002	-.009	5220
2950	1.171	2				1.178	- 1				5310
3000	1.173	2	.001	.002	.005	1.178	0	-.001	-.001	-.004	5400
3100	1.178	5	.001			1.178	0	.000	-.001	.000	5580
3200	1.183	5				1.182	4	.000	.000	.004	5760
3300						1.186	4	-.000	.002	.008	5940
3400						1.191	5	.001	.001	.008	6120
3500						1.195	4	.001	.002	.010	6300
3600						1.198	3	.001	.001	.008	6480
3700						1.198	1	.001	.002	.009	6660
3800						1.198	- 1	.001	.001	.009	6840
3900						1.195	- 2	.001	.002	.007	7020
4000						1.192	- 3	.001	.004	.008	7200
4100						1.191	- 2	-.001	.000	.005	7380
4200						1.190	- 1	-.001	.000	.005	7560
4300						1.191	1	-.000	-.000	.003	7740
4400						1.193	2	.001	.000	.001	7920
4500						1.200	6	-.000	.000	-.000	8100
4600						1.207	8	-.001	-.002	-.002	8280
4700						1.215	8	-.000	.000	-.001	8460
4800						1.225	10	-.001	-.000	-.003	8640
4900						1.236	11	.001	-.001	-.007	8820
5000						1.249	12	.001	-.003	-.012	9000

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
1800	1.288	- 3	-.002	-.004	-.011	1.288	- 3	-.002	-.003	-.010	3240
1850	1.285	- 3				1.285	- 3				3330
1900	1.281	- 4	-.002	-.004	-.013	1.282	- 3	-.002	-.004	-.012	3420
1950	1.277	- 4				1.278	- 4				3510
2000	1.273	- 4	-.003	-.004	-.013	1.274	- 4	-.003	-.004	-.012	3600
2050	1.269	- 4				1.271	- 3				3690
2100	1.265	- 4	-.003	-.006	-.016	1.267	- 4	-.002	-.005	-.015	3780
2150	1.261	- 4				1.263	- 4				3870
2200	1.256	- 5	-.004	-.006	-.017	1.259	- 4	-.003	-.006	-.017	3960
2250	1.252	- 4				1.254	- 5				4050
2300	1.248	- 4	-.006	-.008	-.020	1.249	- 5	-.006	-.008	-.019	4140
2350	1.242	- 6				1.244	- 5				4230
2400	1.235	- 7	-.005	-.008	-.021	1.238	- 6	-.004	-.007	-.020	4320
2450	1.229	- 6				1.233	- 5				4410
2500	1.223	- 6	-.006	-.008	-.022	1.227	- 6	-.006	-.008	-.022	4500
2550	1.217	- 6				1.221	- 6				4590
2600	1.211	- 6	-.004	-.007	-.020	1.215	- 6	-.004	-.008	-.020	4680
2650	1.205	- 6				1.210	- 5				4770
2700	1.200	- 5	-.003	-.007	-.018	1.205	- 5	-.004	-.007	-.019	4860
2750	1.195	- 5				1.200	- 5				4950
2800	1.191	- 4	-.004	-.005	-.015	1.196	- 4	-.004	-.006	-.015	5040
2850	1.188	- 3				1.192	- 4				5130
2900	1.185	- 3	-.001	-.003	-.012	1.189	- 3	-.002	-.004	-.013	5220
2950	1.183	- 2				1.187	- 2				5310
3000	1.181	- 2	-.002	-.002	-.009	1.185	- 2	-.002	-.003	-.011	5400
3100	1.181	0	-.000	-.002	-.003	1.183	- 2	-.001	-.002	-.005	5580
3200	1.182	1	.000	.000	.000	1.183	0	.000	.000	-.002	5760
3300	1.185	3	.000	.002	.005	1.185	2	.000	.002	.002	5940
3400	1.190	5	.001	.001	.006	1.189	4	.001	.001	.005	6120
3500	1.194	4	.001	.002	.009	1.193	4	.001	.002	.008	6300
3600	1.198	4	.001	.001	.008	1.198	5	.001	.001	.008	6480
3700	1.200	2	.001	.002	.010	1.201	3	.001	.002	.010	6660
3800	1.201	1	.001	.002	.010	1.203	2	.001	.002	.010	6840
3900	1.201	- 0	.001	.002	.009	1.204	1	.001	.002	.011	7020
4000	1.200	- 1	.001	.003	.009	1.204	- 0	.001	.002	.010	7200
4100	1.198	- 2	-.000	.001	.007	1.203	- 1	.001	.001	.008	7380
4200	1.197	- 1	-.000	.001	.007	1.202	- 1	.000	.001	.008	7560
4300	1.197	- 0	-.000	.001	.006	1.201	- 1	.000	.001	.007	7740
4400	1.197	- 0	.001	.001	.004	1.200	- 1	.001	.001	.006	7920
4500	1.200	3	-.000	.001	.002	1.202	2	.000	.001	.004	8100
4600	1.205	5	-.000	-.001	.001	1.205	3	.000	.000	.003	8280
4700	1.211	6	-.000	-.000	.001	1.210	5	.000	.000	.002	8460
4800	1.218	8	-.000	-.000	-.001	1.216	6	.000	.000	.000	8640
4900	1.228	9	.000	-.000	-.005	1.223	7	.000	.000	-.003	8820
5000	1.238	11	.001	-.000	-.010	1.232	9	.000	.000	-.007	9000

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
110	1.4202					1.4960					198
120	1.4166	- 36				1.4730	-230				216
130	1.4139	- 27				1.4578	-152				234
140	1.4119	- 20				1.4473	-105				252
150	1.4102	- 17				1.4393	- 80				270
160	1.4089	- 13				1.4338	- 55				288
170	1.4079	- 10				1.4290	- 48				306
180	1.4071	- 8				1.4253	- 37				324
190	1.4064	- 7				1.4222	- 31				342
200	1.4057	- 7				1.4197	- 25				360
210	1.4053	- 4				1.4177	- 20				378
220	1.4048	- 5				1.4158	- 19				396
230	1.4044	- 4				1.4143	- 15				414
240	1.4040	- 4				1.4129	- 14				432
250	1.4036	- 4				1.4118	- 11				450
260	1.4032	- 4				1.4107	- 11				468
270	1.4029	- 3				1.4097	- 10				486
280	1.4024	- 5				1.4087	- 10				504
290	1.4020	- 4				1.4078	- 9				522
300	1.4017	- 3	.000	-.001	-.004	1.4070	- 8	-.002	-.003	-.005	540
310	1.4013	- 4				1.4062	- 8				558
320	1.4008	- 5				1.4053	- 9				576
330	1.4004	- 4				1.4045	- 8				594
340	1.3999	- 5				1.4038	- 7				612
350	1.3993	- 6				1.4030	- 8				630
360	1.3987	- 6				1.4022	- 8				648
370	1.3981	- 6				1.4014	- 8				666
380	1.3975	- 6				1.4005	- 9				684
390	1.3968	- 7				1.3997	- 8				702
400	1.3961	- 7	.000	-.001	-.004	1.3987	- 10	-.001	-.002	-.004	720
410	1.3953	- 8				1.3979	- 8				738
420	1.3946	- 7				1.3970	- 9				756
430	1.3938	- 8				1.3960	- 10				774
440	1.3929	- 9				1.3950	- 10				792
450	1.3920	- 9				1.3940	- 10				810
460	1.3911	- 9				1.3930	- 10				828
470	1.3901	- 10				1.3919	- 11				846
480	1.3892	- 9				1.3909	- 10				864
490	1.3881	- 11				1.3898	- 11				882
500	1.3871	- 10	.000	-.001	-.004	1.3887	- 11	-.000	-.001	-.004	900
510	1.3861	- 10				1.3876	- 11				918
520	1.3851	- 10				1.3865	- 11				936
530	1.3840	- 11				1.3853	- 12				954
540	1.3829	- 11				1.3842	- 11				972

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
110	1.6035					1.7672					198
120	1.5513	-522				1.6395	-1277				216
130	1.5139	-374				1.5740	-655				234
140	1.4901	-238				1.5350	-390				252
150	1.4734	-167				1.5084	-266				270
160	1.4614	-120				1.4896	-188				288
170	1.4521	- 93				1.4756	-140				306
180	1.4448	- 73				1.4648	-108				324
190	1.4391	- 57				1.4560	- 88				342
200	1.4344	- 47				1.4489	- 71				360
210	1.4306	- 38				1.4437	- 52				378
220	1.4272	- 34				1.4389	- 48				396
230	1.4246	- 26				1.4348	- 41				414
240	1.4222	- 24				1.4313	- 35				432
250	1.4201	- 21				1.4284	- 29				450
260	1.4183	- 18				1.4259	- 25				468
270	1.4166	- 17				1.4236	- 23				486
280	1.4150	- 16				1.4214	- 22				504
290	1.4135	- 15				1.4194	- 20				522
300	1.4123	- 12	-.003	-.002	-.003	1.4177	- 17	-.003	-.001	-.000	540
310	1.4111	- 12				1.4161	- 16				558
320	1.4100	- 11				1.4146	- 15				576
330	1.4089	- 11				1.4131	- 15				594
340	1.4077	- 12				1.4118	- 13				612
350	1.4067	- 10				1.4104	- 14				630
360	1.4056	- 11				1.4091	- 13				648
370	1.4046	- 10				1.4079	- 12				666
380	1.4036	- 10				1.4066	- 13				684
390	1.4025	- 11				1.4054	- 12				702
400	1.4014	- 11	-.001	-.001	-.003	1.4041	- 13	-.001	-.000	-.002	720
410	1.4004	- 10				1.4028	- 13				738
420	1.3994	- 10				1.4016	- 12				756
430	1.3982	- 12				1.4003	- 13				774
440	1.3972	- 10				1.3991	- 12				792
450	1.3960	- 12				1.3979	- 12				810
460	1.3949	- 11				1.3967	- 12				828
470	1.3938	- 11				1.3955	- 12				846
480	1.3926	- 12				1.3943	- 12				864
490	1.3914	- 12				1.3930	- 13				882
500	1.3903	- 11	-.000	-.000	-.003	1.3918	- 12	.000	.000	-.003	900
510	1.3891	- 12				1.3906	- 12				918
520	1.3879	- 12				1.3893	- 13				936
530	1.3866	- 13				1.3880	- 13				954
540	1.3854	- 12				1.3867	- 13				972

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
550	1.3818	- 11				1.3830	- 12				990
560	1.3806	- 12				1.3818	- 12				1008
570	1.3795	- 11				1.3806	- 12				1026
580	1.3783	- 12				1.3794	- 12				1044
590	1.3782	- 11				1.3782	- 12				1062
600	1.3760	- 12	.000	-.001	-.005	1.3770	- 12	-.000	-.001	-.004	1080
610	1.3749	- 11				1.3758	- 12				1098
620	1.3737	- 12				1.3746	- 12				1116
630	1.3726	- 11				1.3734	- 12				1134
640	1.3714	- 12				1.3722	- 12				1152
650	1.3702	- 12				1.3710	- 12				1170
660	1.3691	- 11				1.3699	- 11				1188
670	1.3679	- 12				1.3687	- 12				1206
680	1.3668	- 11				1.3675	- 12				1224
690	1.3657	- 11				1.3664	- 11				1242
700	1.3646	- 11	-.001	-.001	-.005	1.3652	- 12	.000	-.001	-.005	1260
710	1.3634	- 12				1.3641	- 11				1278
720	1.3623	- 11				1.3629	- 12				1296
730	1.3612	- 11				1.3618	- 11				1314
740	1.3601	- 11				1.3607	- 11				1332
750	1.3591	- 10				1.3596	- 11				1350
760	1.3580	- 11				1.3585	- 11				1368
770	1.3569	- 11				1.3574	- 11				1386
780	1.3559	- 10				1.3564	- 10				1404
790	1.3549	- 10				1.3553	- 11				1422
800	1.3538	- 11	.000	-.001	-.005	1.3542	- 11	-.000	-.001	-.005	1440
850	1.349	- 5				1.349	- 5				1530
900	1.345	- 4	.000	-.001	-.005	1.345	- 4	.000	.000	-.005	1620
950	1.340	- 5				1.340	- 5				1710
1000	1.336	- 4	.000	-.002	-.006	1.336	- 4	-.000	-.001	-.005	1800
1050	1.332	- 4				1.332	- 4				1890
1100	1.329	- 3	-.001	-.002	-.006	1.329	- 3	-.001	-.001	-.006	1980
1150	1.325	- 4				1.325	- 4				2070
1200	1.322	- 3	-.001	-.002	-.006	1.322	- 3	-.000	-.001	-.006	2160
1250	1.319	- 3				1.319	- 3				2250
1300	1.316	- 3	-.001	-.001	-.006	1.316	- 3	-.001	-.001	-.006	2340
1350	1.313	- 3				1.313	- 3				2430
1400	1.310	- 3	-.001	-.001	-.006	1.310	- 3	-.001	-.001	-.006	2520
1450	1.307	- 3				1.307	- 3				2610
1500	1.304	- 3	.000	-.001	-.006	1.304	- 3	-.001	-.001	-.006	2700
1550	1.301	- 3				1.301	- 3				2790
1600	1.299	- 2	-.001	-.002	-.008	1.299	- 2	-.001	-.002	-.007	2880
1650	1.296	- 3				1.296	- 3				2970
1700	1.293	- 3	-.003	-.004	-.009	1.293	- 3	-.001	-.002	-.007	3060
1750	1.291	- 2				1.291	- 2				3150

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
550	1.3842	- 12				1.3854	- 13				990
560	1.3829	- 13				1.3840	- 14				1008
570	1.3817	- 12				1.3827	- 13				1026
580	1.3805	- 12				1.3814	- 13				1044
590	1.3792	- 13				1.3801	- 13				1062
600	1.3780	- 12	-.000	-.000	-.004	1.3788	- 13	.000	-.000	-.004	1080
610	1.3768	- 12				1.3775	- 13				1098
620	1.3756	- 12				1.3763	- 12				1116
630	1.3743	- 13				1.3751	- 12				1134
640	1.3730	- 13				1.3739	- 12				1152
650	1.3719	- 11				1.3726	- 13				1170
660	1.3706	- 13				1.3714	- 12				1188
670	1.3694	- 12				1.3701	- 13				1206
680	1.3682	- 12				1.3688	- 13				1224
690	1.3670	- 12				1.3676	- 12				1242
700	1.3658	- 12	-.000	-.001	-.006	1.3664	- 12	-.001	-.001	-.006	1260
710	1.3647	- 11				1.3652	- 12				1278
720	1.3635	- 12				1.3641	- 11				1296
730	1.3624	- 11				1.3629	- 12				1314
740	1.3613	- 11				1.3618	- 11				1332
750	1.3601	- 12				1.3606	- 12				1350
760	1.3590	- 11				1.3595	- 11				1368
770	1.3579	- 11				1.3583	- 12				1386
780	1.3568	- 11				1.3572	- 11				1404
790	1.3557	- 11				1.3561	- 11				1422
800	1.3547	- 10	-.001	-.001	-.005	1.3550	- 11	-.001	-.001	-.005	1440
850	1.3495	- 52				1.3499	- 51				1530
900	1.3448	- 47	.000	-.000	-.005	1.3452	- 47	.000	-.000	-.005	1620
950	1.3403	- 45				1.3406	- 46				1710
1000	1.3362	- 41	-.000	-.001	-.005	1.3364	- 42	-.001	-.001	-.005	1800
1050	1.3324	- 38				1.3326	- 38				1890
1100	1.3286	- 38	-.001	-.001	-.006	1.3288	- 38	-.001	-.001	-.005	1980
1150	1.3252	- 34				1.3254	- 34				2070
1200	1.3219	- 33	.000	-.001	-.006	1.3221	- 33	.000	-.001	-.006	2160
1250	1.3187	- 32				1.3188	- 33				2250
1300	1.3156	- 31	-.001	-.001	-.006	1.3156	- 32	-.001	-.001	-.006	2340
1350	1.3127	- 29				1.3127	- 29				2430
1400	1.3098	- 29	-.001	-.001	-.006	1.3098	- 29	-.001	-.001	-.006	2520
1450	1.3070	- 28				1.3070	- 28				2610
1500	1.3042	- 28	-.001	-.001	-.006	1.3043	- 27	-.001	-.001	-.006	2700
1550	1.301	- 3				1.302	- 2				2790
1600	1.299	- 2	-.001	-.002	-.007	1.299	- 3	-.001	-.002	-.007	2880
1650	1.296	- 3				1.296	- 3				2970
1700	1.293	- 3	.000	-.001	-.007	1.293	- 3	.001	-.000	-.007	3060
1750	1.290	- 3				1.290	- 3				3150

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
1800	1.288	- 3	-.002	-.003	-.010	1.288	- 3	-.001	-.001	-.009	3240
1850	1.285	- 3				1.286	- 2				3330
1900	1.282	- 3	-.002	-.004	-.012	1.283	- 3	-.002	-.003	-.011	3420
1950	1.278	- 4				1.280	- 3				3510
2000	1.274	- 4	-.003	-.004	-.012	1.277	- 3	-.003	-.004	-.011	3600
2050	1.271	- 3				1.274	- 3				3690
2100	1.267	- 4	-.002	-.005	-.015	1.271	- 3	-.002	-.004	-.013	3780
2150	1.263	- 4				1.268	- 3				3870
2200	1.259	- 4	-.003	-.006	-.017	1.265	- 3	-.004	-.006	-.015	3960
2250	1.254	- 5				1.261	- 4				4050
2300	1.249	- 5	-.006	-.008	-.019	1.257	- 4	-.004	-.006	-.016	4140
2350	1.244	- 5				1.253	- 4				4230
2400	1.238	- 6	-.004	-.007	-.020	1.249	- 4	-.004	-.007	-.018	4320
2450	1.233	- 5				1.245	- 4				4410
2500	1.227	- 6	-.006	-.008	-.022	1.241	- 4	-.006	-.007	-.020	4500
2550	1.221	- 6				1.237	- 4				4590
2600	1.215	- 6	-.004	-.008	-.020	1.232	- 5	-.004	-.008	-.019	4680
2650	1.210	- 5				1.228	- 4				4770
2700	1.205	- 5	-.004	-.007	-.019	1.224	- 4	-.005	-.007	-.020	4860
2750	1.200	- 5				1.219	- 5				4950
2800	1.196	- 4	-.004	-.006	-.015	1.215	- 4	-.004	-.007	-.018	5040
2850	1.192	- 4				1.211	- 4				5130
2900	1.189	- 3	-.002	-.004	-.013	1.207	- 4	-.002	-.006	-.017	5220
2950	1.187	- 2				1.204	- 3				5310
3000	1.185	- 2	-.002	-.003	-.011	1.201	- 3	-.003	-.005	-.017	5400
3100	1.183	- 2	-.001	-.002	-.005	1.196	- 5	-.001	-.004	-.012	5580
3200	1.183	0	.000	.000	-.002	1.192	- 4	-.001	-.002	-.009	5760
3300	1.185	2	.000	.002	.002	1.191	- 1	-.001	-.001	-.007	5940
3400	1.189	4	.001	.001	.005	1.192	1	.001	.000	-.003	6120
3500	1.193	4	.001	.002	.008	1.194	2	-.000	.000	-.001	6300
3600	1.198	5	.001	.001	.008	1.197	3	-.000	-.000	.002	6480
3700	1.201	3	.001	.002	.010	1.200	3	.001	.002	.006	6660
3800	1.203	2	.001	.002	.010	1.204	4	.001	.002	.007	6840
3900	1.204	1	.001	.002	.011	1.208	4	.001	.002	.009	7020
4000	1.204	- 0	.001	.002	.010	1.211	3	.001	.001	.010	7200
4100	1.203	- 1	.001	.001	.008	1.213	2	.002	.002	.010	7380
4200	1.202	- 1	.000	.001	.008	1.215	1	.002	.002	.011	7560
4300	1.201	- 1	.000	.001	.007	1.216	1	.001	.003	.011	7740
4400	1.200	- 1	.001	.001	.006	1.215	- 1	.001	.002	.011	7920
4500	1.202	2	.000	.001	.004	1.215	- 0	.001	.002	.010	8100
4600	1.205	3	.000	.000	.003	1.215	- 0	.002	.003	.010	8280
4700	1.210	5	.000	.000	.002	1.215	1	.001	.002	.008	8460
4800	1.216	6	.000	.000	.000	1.216	1	.001	.001	.007	8640
4900	1.223	7	.000	.000	-.003	1.217	1	-.000	-.000	.006	8820
5000	1.232	9	.000	.000	-.007	1.219	2	-.000	-.000	.004	9000

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
1800	1.288	- 2	-.001	-.001	-.008	1.288	- 2	-.001	-.001	-.008	3240
1850	1.286	- 2				1.286	- 2				3330
1900	1.283	- 3	-.002	-.003	-.010	1.283	- 3	-.002	-.003	-.010	3420
1950	1.281	- 2				1.281	- 2				3510
2000	1.278	- 3	-.003	-.004	-.011	1.278	- 3	-.003	-.004	-.011	3600
2050	1.275	- 3				1.275	- 3				3690
2100	1.272	- 3	-.002	-.004	-.012	1.272	- 3	-.002	-.004	-.012	3780
2150	1.270	- 2				1.270	- 2				3870
2200	1.267	- 3	-.004	-.006	-.014	1.267	- 3	-.004	-.006	-.014	3960
2250	1.263	- 4				1.264	- 3				4050
2300	1.259	- 4	-.003	-.005	-.014	1.260	- 4	-.003	-.005	-.014	4140
2350	1.256	- 3				1.257	- 3				4230
2400	1.253	- 3	-.005	-.007	-.017	1.254	- 3	-.005	-.007	-.017	4320
2450	1.249	- 4				1.251	- 3				4410
2500	1.245	- 4	-.005	-.006	-.019	1.247	- 4	-.005	-.006	-.018	4500
2550	1.241	- 4				1.244	- 3				4590
2600	1.237	- 4	-.004	-.007	-.019	1.240	- 4	-.004	-.007	-.018	4680
2650	1.234	- 3				1.237	- 3				4770
2700	1.230	- 4	-.005	-.007	-.019	1.233	- 4	-.005	-.007	-.018	4860
2750	1.226	- 4				1.230	- 3				4950
2800	1.222	- 4	-.004	-.007	-.019	1.226	- 4	-.004	-.007	-.019	5040
2850	1.218	- 4				1.222	- 4				5130
2900	1.214	- 4	-.003	-.006	-.018	1.218	- 4	-.003	-.006	-.018	5220
2950	1.211	- 3				1.215	- 3				5310
3000	1.208	- 3	-.003	-.005	-.017	1.212	- 3	-.00.	-.005	-.017	5400
3100	1.202	- 6	-.002	-.004	-.014	1.206	- 6	-.002	-.005	-.015	5580
3200	1.198	- 4	-.001	-.003	-.011	1.202	- 4	-.002	-.004	-.013	5760
3300	1.196	- 2	-.001	-.003	-.010	1.200	- 2	-.002	-.004	-.011	5940
3400	1.195	- 1	.000	-.001	-.006	1.197	- 3	-.001	-.001	-.007	6120
3500	1.196	1	-.001	-.001	-.004	1.198	1	-.001	-.002	-.007	6300
3600	1.198	2	-.000	-.001	-.001	1.199	1	.000	-.001	-.003	6480
3700	1.200	2	.001	.001	.003	1.200	1	.001	.001	.001	6660
3800	1.204	4	.000	.001	.004	1.204	4	.000	.000	.002	6840
3900	1.208	4	.001	.002	.007	1.207	3	.000	.001	.005	7020
4000	1.211	3	.001	.002	.008	1.211	4	.001	.002	.006	7200
4100	1.214	3	.002	.002	.009	1.214	3	.001	.002	.008	7380
4200	1.217	3	.002	.002	.010	1.217	3	.002	.001	.010	7560
4300	1.219	2	.001	.003	.011	1.220	2	.001	.003	.010	7740
4400	1.220	1	.001	.002	.012	1.221	2	.001	.002	.011	7920
4500	1.220	0	.001	.002	.012	1.222	1	.002	.003	.012	8100
4600	1.220	0	.002	.003	.011	1.223	1	.002	.003	.011	8280
4700	1.220	0	.001	.002	.010	1.224	0	.001	.003	.012	8460
4800	1.221	1	.001	.001	.009	1.224	0	.001	.002	.010	8640
4900	1.221	0	.000	.000	.008	1.224	0	.001	.000	.010	8820
5000	1.221	0	.000	.000	.008	1.224	- 0	.001	.000	.009	9000

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
110	1.7672										198
120	1.6395	-1277									216
130	1.5740	-655									234
140	1.5350	-390									252
150	1.5084	-266				2.7372					270
160	1.4896	-188				2.1168	-6204				288
170	1.4756	-140				1.8886	-2282				306
180	1.4648	-108				1.7678	-1208				324
190	1.4560	- 88				1.6922	-756				342
200	1.4489	- 71				1.6418	-504				360
210	1.4437	- 52				1.6026	-392				378
220	1.4389	- 48				1.5740	-286				396
230	1.4348	- 41				1.5515	-225				414
240	1.4313	- 35				1.5334	-181				432
250	1.4284	- 29				1.5185	-149				450
260	1.4259	- 25				1.5062	-123				468
270	1.4236	- 23				1.4956	-106				486
280	1.4214	- 22				1.4865	- 91				504
290	1.4194	- 20				1.4786	- 79				522
300	1.4177	- 17	-.003	-.001	-.000	1.4717	- 69				540
310	1.4161	- 16				1.4658	- 59				558
320	1.4146	- 15				1.4603	- 55				576
330	1.4131	- 15				1.4553	- 50				594
340	1.4118	- 13				1.4507	- 46				612
350	1.4104	- 14				1.4465	- 42				630
360	1.4091	- 13				1.4429	- 36				648
370	1.4079	- 12				1.4394	- 35				666
380	1.4066	- 13				1.4361	- 33				684
390	1.4054	- 12				1.4329	- 32				702
400	1.4041	- 13	-.001	-.000	-.002	1.4299	- 30				720
410	1.4028	- 13				1.4273	- 26				738
420	1.4016	- 12				1.4246	- 27				756
430	1.4003	- 13				1.4220	- 26				774
440	1.3991	- 12				1.4194	- 26				792
450	1.3979	- 12				1.4168	- 26				810
460	1.3967	- 12				1.4148	- 20				828
470	1.3955	- 12				1.4127	- 21				846
480	1.3943	- 12				1.4106	- 21				864
490	1.3930	- 13				1.4086	- 20				882
500	1.3918	- 12	.000	.000	-.003	1.4065	- 21	.001	.001	.001	900
510	1.3906	- 12				1.4046	- 19				918
520	1.3893	- 13				1.4027	- 19				936
530	1.3880	- 13				1.4008	- 19				954
540	1.3867	- 13				1.3988	- 20				972

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
180	2.3139										324
190	2.0467	-2672									342
200	1.9000	-1467				2.1376					360
210	1.7995	-1005				1.9802	-1574				378
220	1.7318	-677				1.8769	-1033				396
230	1.6818	-500				1.8012	-757				414
240	1.6434	-384				1.7439	-573				432
250	1.6130	-304				1.6990	-449				450
260	1.5885	-245				1.6631	-359				468
270	1.5683	-202				1.6339	-292				486
280	1.5511	-172				1.6094	-245				504
290	1.5365	-146				1.5887	-207				522
300	1.5240	-125				1.5711	-176				540
310	1.5132	-108				1.5559	-152				558
320	1.5035	- 97				1.5425	-134				576
330	1.4948	- 87				1.5307	-118				594
340	1.4871	- 77				1.5202	-105				612
350	1.4804	- 67				1.5109	- 93				630
360	1.4742	- 62				1.5024	- 85				648
370	1.4685	- 57				1.4947	- 77				666
380	1.4632	- 53				1.4878	- 69				684
390	1.4583	- 49				1.4813	- 65				702
400	1.4537	- 46				1.4752	- 61				720
410	1.4492	- 45				1.4693	- 59				738
420	1.4449	- 43				1.4638	- 55				756
430	1.4412	- 37				1.4588	- 50				774
440	1.4376	- 36				1.4541	- 47				792
450	1.4342	- 34				1.4498	- 43				810
460	1.4312	- 30				1.4461	- 37				828
470	1.4283	- 29				1.4425	- 36				846
480	1.4252	- 31				1.4389	- 36				864
490	1.4224	- 28				1.4355	- 34				882
500	1.4199	- 25				1.4321	- 34				900
510	1.4172	- 27				1.4289	- 32				918
520	1.4148	- 24				1.4258	- 31				936
530	1.4122	- 26				1.4227	- 31				954
540	1.4098	- 24				1.4198	- 29				972

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
550	1.3854	- 13				1.3969	- 19				990
560	1.3840	- 14				1.3952	- 17				1008
570	1.3827	- 13				1.3934	- 18				1026
580	1.3814	- 13				1.3917	- 17				1044
590	1.3801	- 13				1.3899	- 18				1062
600	1.3788	- 13	.000	-.000	-.004	1.3882	- 17	-.000	-.001	-.005	1080
610	1.3775	- 13				1.3866	- 16				1098
620	1.3763	- 12				1.3850	- 16				1116
630	1.3751	- 12				1.3834	- 16				1134
640	1.3739	- 12				1.3817	- 17				1152
650	1.3726	- 13				1.3801	- 16				1170
660	1.3714	- 12				1.3785	- 16				1188
670	1.3701	- 13				1.3770	- 15				1206
680	1.3688	- 13				1.3755	- 15				1224
690	1.3676	- 12				1.3740	- 15				1242
700	1.3664	- 12	-.001	-.001	-.006	1.3725	- 15	-.002	-.001	-.006	1260
710	1.3652	- 12				1.3712	- 13				1278
720	1.3641	- 11				1.3698	- 14				1296
730	1.3629	- 12				1.3685	- 13				1314
740	1.3618	- 11				1.3671	- 14				1332
750	1.3606	- 12				1.3658	- 13				1350
760	1.3595	- 11				1.3645	- 13				1368
770	1.3583	- 12				1.3632	- 13				1386
780	1.3572	- 11				1.3619	- 13				1404
790	1.3561	- 11				1.3606	- 13				1422
800	1.3550	- 11	-.001	-.001	-.005	1.3593	- 13	-.001	-.001	-.005	1440
850	1.3499	- 51				1.3531	- 62				1530
900	1.3452	- 47	.000	-.000	-.005	1.3480	- 50	.000	-.002	-.005	1620
950	1.3406	- 46				1.3430	- 50				1710
1000	1.3364	- 42	-.001	-.001	-.005	1.3386	- 40	-.001	-.002	-.007	1800
1050	1.3326	- 38				1.3344	- 42				1890
1100	1.3288	- 38	-.001	-.001	-.005	1.3303	- 41	.000	-.001	-.005	1980
1150	1.3254	- 34				1.3267	- 36				2070
1200	1.3221	- 33	.000	-.001	-.006	1.3232	- 35	-.000	-.001	-.006	2160
1250	1.3188	- 33				1.3198	- 34				2250
1300	1.3156	- 32	-.001	-.001	-.006	1.3165	- 33	.000	-.001	-.006	2340
1350	1.3127	- 29				1.3135	- 30				2430
1400	1.3098	- 29	-.001	-.001	-.006	1.3106	- 29	-.001	-.001	-.006	2520
1450	1.3070	- 28				1.3076	- 30				2610
1500	1.3043	- 27	-.001	-.001	-.006	1.3047	- 29	.001	-.001	-.006	2700
1550	1.302	- 2				1.303	- 2				2790
1600	1.299	- 3	-.001	-.002	-.007	1.301	- 2	-.001	-.002	-.007	2880
1650	1.296	- 3				1.298	- 3				2970
1700	1.293	- 3	.001	-.000	-.007	1.294	- 4	-.000	-.001	-.007	3060
1750	1.290	- 3				1.291	- 3				3150

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
550	1.4073	- 25				1.4170	- 28				990
560	1.4051	- 22				1.4142	- 28				1008
570	1.4029	- 22				1.4116	- 26				1026
580	1.4008	- 21				1.4090	- 26				1044
590	1.3987	- 21				1.4065	- 25				1062
600	1.3967	- 20				1.4041	- 24				1080
610	1.3947	- 20				1.4018	- 23				1098
620	1.3927	- 20				1.3995	- 23				1116
630	1.3907	- 20				1.3973	- 22				1134
640	1.3888	- 19				1.3951	- 22				1152
650	1.3869	- 19				1.3931	- 20				1170
660	1.3850	- 19				1.3910	- 21				1188
670	1.3833	- 17				1.3890	- 20				1206
680	1.3816	- 17				1.3870	- 20				1224
690	1.3800	- 16				1.3851	- 19				1242
700	1.3783	- 17				1.3832	- 19				1260
710	1.3766	- 17				1.3814	- 18				1278
720	1.3750	- 16				1.3796	- 18				1296
730	1.3734	- 16				1.3778	- 18				1314
740	1.3718	- 16				1.3761	- 17				1332
750	1.3703	- 15				1.3745	- 16				1350
760	1.3688	- 15				1.3729	- 16				1368
770	1.3673	- 15				1.3713	- 16				1386
780	1.3659	- 14				1.3697	- 16				1404
790	1.3645	- 14				1.3681	- 16				1422
800	1.3631	- 14	-.000	-.001	-.005	1.3665	- 16				1440
850	1.3566	- 65				1.3595	- 70				1530
900	1.3506	- 60	.000	-.001	-.006	1.3533	- 62				1620
950	1.3454	- 52				1.3476	- 57				1710
1000	1.3406	- 48	-.001	-.001	-.007	1.3423	- 53				1800
1050	1.3362	- 44				1.3378	- 45				1890
1100	1.3319	- 43	-.000	-.001	-.006	1.3333	- 45	-.001	-.001	-.007	1980
1150	1.3281	- 38				1.3293	- 40				2070
1200	1.3243	- 38	-.000	-.001	-.006	1.3254	- 39	-.000	-.001	-.006	2160
1250	1.3208	- 35				1.3217	- 37				2250
1300	1.3174	- 34	.001	-.001	-.006	1.3181	- 36	.000	-.001	-.006	2340
1350	1.3142	- 32				1.3149	- 32				2430
1400	1.3111	- 31	-.001	-.001	-.006	1.3117	- 32	-.001	-.002	-.007	2520
1450	1.3081	- 30				1.3086	- 31				2610
1500	1.3052	- 29	.001	-.001	-.006	1.3056	- 30	.001	-.001	-.006	2700
1550	1.303	- 2				1.304	- 2				2790
1600	1.302	- 1	-.001	-.001	-.007	1.303	- 1	-.000	-.001	-.007	2880
1650	1.299	- 3				1.300	- 3				2970
1700	1.296	- 3	-.001	-.002	-.008	1.297	- 3	-.002	-.002	-.008	3060
1750	1.293	- 3				1.294	- 3				3150

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
1800	1.288	- 2	-.001	-.001	-.008	1.289	- 2	-.001	-.002	-.007	3240
1850	1.286	- 2				1.286	- 3				3330
1900	1.283	- 3	-.002	-.003	-.010	1.284	- 2	-.001	-.002	-.008	3420
1950	1.281	- 2				1.281	- 3				3510
2000	1.278	- 3	-.003	-.004	-.011	1.279	- 2	-.002	-.003	-.009	3600
2050	1.275	- 3				1.277	- 2				3690
2100	1.272	- 3	-.002	-.004	-.012	1.274	- 3	-.002	-.003	-.010	3780
2150	1.270	- 2				1.272	- 2				3870
2200	1.267	- 3	-.004	-.006	-.014	1.269	- 3	-.003	-.004	-.011	3960
2250	1.264	- 3				1.267	- 2				4050
2300	1.260	- 4	-.003	-.005	-.014	1.264	- 3	-.003	-.004	-.012	4140
2350	1.257	- 3				1.262	- 2				4230
2400	1.254	- 3	-.005	-.007	-.017	1.259	- 3	-.003	-.005	-.013	4320
2450	1.251	- 3				1.256	- 3				4410
2500	1.247	- 4	-.005	-.006	-.018	1.253	- 3	-.004	-.006	-.015	4500
2550	1.244	- 3				1.250	- 3				4590
2600	1.240	- 4	-.004	-.007	-.018	1.248	- 2	-.004	-.006	-.015	4680
2650	1.237	- 3				1.246	- 2				4770
2700	1.233	- 4	-.005	-.007	-.018	1.243	- 3	-.004	-.006	-.016	4860
2750	1.230	- 3				1.240	- 3				4950
2800	1.226	- 4	-.004	-.007	-.019	1.237	- 3	-.004	-.006	-.017	5040
2850	1.222	- 4				1.234	- 3				5130
2900	1.218	- 4	-.003	-.006	-.018	1.232	- 2	-.004	-.006	-.017	5220
2950	1.215	- 3				1.229	- 3				5310
3000	1.212	- 3	-.003	-.005	-.017	1.226	- 3	-.004	-.006	-.017	5400
3100	1.206	- 6	-.002	-.005	-.015	1.222	- 4	-.004	-.006	-.016	5580
3200	1.202	- 4	-.002	-.004	-.013	1.217	- 5	-.003	-.005	-.015	5760
3300	1.200	- 2	-.002	-.004	-.011	1.213	- 4	-.002	-.004	-.014	5940
3400	1.197	- 3	-.001	-.001	-.007	1.210	- 3	-.002	-.002	-.013	6120
3500	1.198	1	-.001	-.002	-.007	1.208	- 2	-.001	-.003	-.011	6300
3600	1.199	1	.000	-.001	-.003	1.207	- 1	-.000	-.002	-.010	6480
3700	1.200	1	.001	.001	.001	1.206	- 1	-.000	-.001	-.007	6660
3800	1.204	4	.000	.000	.002	1.207	1	-.000	.000	-.005	6840
3900	1.207	3	.000	.001	.005	1.208	1	-.000	.000	-.002	7020
4000	1.211	4	.001	.002	.006	1.210	2	.001	.000	-.001	7200
4100	1.214	3	.001	.002	.008	1.212	2	.001	.002	.002	7380
4200	1.217	3	.002	.001	.010	1.216	4	.000	.000	.004	7560
4300	1.220	2	.001	.003	.010	1.219	3	.001	.001	.006	7740
4400	1.221	2	.001	.002	.011	1.223	4	.001	.002	.007	7920
4500	1.222	1	.002	.003	.012	1.226	3	.002	.003	.010	8100
4600	1.223	1	.002	.003	.011	1.230	4	.001	.001	.009	8280
4700	1.224	0	.001	.003	.012	1.232	2	.001	.002	.012	8460
4800	1.224	0	.001	.002	.010	1.234	2	.001	.002	.011	8640
4900	1.224	0	.001	.000	.010	1.236	2	.000	.001	.011	8820
5000	1.224	0	.001	.000	.009	1.238	2	-.000	.001	.011	9000

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Continued)
(See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			γ Residuals, for mole % moisture content					γ Residuals, for mole % moisture content			
	γ	Δ	0.1	1.0	5.0	γ	Δ	0.1	1.0	5.0	
1800	1.290	- 3	-.001	-.003	-.007	1.291	- 3	-.001	-.003	-.007	3240
1850	1.287	- 3				1.288	- 3				3330
1900	1.285	- 2	-.000	-.002	-.007	1.286	- 2	-.000	-.001	-.007	3420
1950	1.282	- 3				1.283	- 3				3510
2000	1.280	- 2	-.001	-.002	-.008	1.281	- 2	-.001	-.002	-.008	3600
2050	1.278	- 2				1.279	- 2				3690
2100	1.275	- 3	-.002	-.003	-.009	1.276	- 3	-.002	-.003	-.009	3780
2150	1.272	- 3				1.273	- 3				3870
2200	1.270	- 2	-.002	-.003	-.010	1.270	- 3	-.002	-.003	-.009	3960
2250	1.267	- 3				1.268	- 2				4050
2300	1.265	- 2	-.003	-.004	-.012	1.266	- 2	-.003	-.004	-.011	4140
2350	1.263	- 2				1.264	- 2				4230
2400	1.260	- 3	-.002	-.004	-.012	1.261	- 3	-.001	-.003	-.011	4320
2450	1.258	- 2				1.259	- 2				4410
2500	1.256	- 2	-.004	-.006	-.014	1.257	- 2	-.004	-.006	-.014	4500
2550	1.254	- 2				1.255	- 2				4590
2600	1.251	- 3	-.004	-.006	-.014	1.252	- 3	-.004	-.006	-.014	4680
2650	1.248	- 3				1.249	- 3				4770
2700	1.246	- 2	-.004	-.006	-.016	1.247	- 2	-.003	-.005	-.016	4860
2750	1.243	- 3				1.245	- 2				4950
2800	1.241	- 2	-.004	-.006	-.015	1.243	- 2	-.004	-.005	-.014	5040
2850	1.238	- 3				1.240	- 3				5130
2900	1.236	- 2	-.004	-.006	-.017	1.238	- 2	-.004	-.006	-.016	5220
2950	1.233	- 3				1.236	- 2				5310
3000	1.231	- 2	-.004	-.006	-.017	1.234	- 2	-.004	-.006	-.017	5400
3100	1.227	- 4	-.004	-.006	-.016	1.230	- 4	-.005	-.006	-.016	5580
3200	1.222	- 5	-.003	-.005	-.016	1.225	- 5	-.003	-.004	-.016	5760
3300	1.218	- 4	-.002	-.004	-.014	1.221	- 4	-.002	-.003	-.014	5940
3400	1.215	- 3	-.002	-.003	-.013	1.218	- 3	-.002	-.004	-.013	6120
3500	1.213	- 2	-.001	-.003	-.011	1.215	- 3	-.001	-.003	-.011	6300
3600	1.211	- 2	-.001	-.003	-.011	1.214	- 1	-.001	-.004	-.012	6480
3700	1.210	- 1	-.001	-.002	-.009	1.213	- 1	-.002	-.002	-.010	6660
3800	1.210	- 0	-.000	.001	-.007	1.212	- 1	.000	.001	-.008	6840
3900	1.210	- 0	-.000	.000	-.004	1.212	0	.000	-.000	-.005	7020
4000	1.212	2	.000	-.002	-.004	1.213	1	-.000	-.003	-.005	7200
4100	1.213	1	.001	.001	-.000	1.214	1	.001	.001	-.002	7380
4200	1.216	3	.000	.000	.001	1.216	2	.000	-.000	-.001	7560
4300	1.219	3	.000	.001	.003	1.219	3	-.000	.001	.001	7740
4400	1.222	3	.001	.001	.005	1.221	2	.001	.001	.004	7920
4500	1.225	3	.001	.002	.008	1.224	3	.001	.002	.006	8100
4600	1.229	4	.001	.001	.007	1.228	4	.001	.001	.006	8280
4700	1.232	3	.000	.002	.009	1.231	3	-.000	.001	.007	8460
4800	1.235	3	.000	.001	.010	1.234	3	.000	.001	.008	8640
4900	1.238	3	-.001	.001	.010	1.237	3	-.002	.001	.009	8820
5000	1.240	2	-.002	.001	.011	1.240	3	-.004	.001	.010	9000

Table 1510.08 RATIO OF SPECIFIC HEATS (γ) for dry and moist air (Concluded)
(See Section 1500.3 for definition of residuals)

1510.09 Velocity of Sound

0.01 Atmosphere Pressure							
T (°K)	a	Δ	T (°R)	T (°K)	a	Δ	T (°R)
50	464.9		90	300	1139.2	191	540
60	509.5	446	108	310	1157.9	187	558
70	550.3	408	126	320	1176.4	185	576
80	588.5	382	144	330	1194.4	180	594
90	624.2	357	162	340	1212.3	179	612
100	658.0	338	180	350	1229.7	174	630
110	690.1	321	198	360	1246.8	171	648
120	720.9	308	216	370	1263.8	170	666
130	750.3	294	234	380	1280.4	166	684
140	778.6	283	252	390	1297.0	166	702
150	805.9	273	270	400	1313.2	162	720
160	832.3	264	288	410	1329.2	160	738
170	858.0	257	306	420	1344.8	156	756
180	882.9	249	324	430	1360.5	157	774
190	907.0	241	342	440	1375.8	153	792
200	930.5	235	360	450	1390.9	151	810
210	953.6	231	378	460	1405.8	149	828
220	976.0	224	396	470	1420.5	147	846
230	997.8	218	414	480	1435.1	146	864
240	1019.2	214	432	490	1449.4	143	882
250	1040.2	210	450	500	1463.7	143	900
260	1060.8	206	468	510	1477.7	140	918
270	1081.0	202	486	520	1491.5	138	936
280	1100.7	197	504	530	1505.2	137	954
290	1120.1	194	522	540	1518.8	136	972

Moisture residuals at 300°K(540°R)

Mole % moisture content	0.5	1.0	5.0
a Residuals	2.00	3.00	9.00

Conversion Factors for Velocity of Sound (a)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
a with dimensions of ft sec^{-1}	a	mi hr^{-1}	0.681818
		m sec^{-1}	0.304801

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air
(See Section 1500.3 for definition of residuals)

0.01 Atmosphere Pressure							
T (°K)	a	Δ	T (°R)	T (°K)	a	Δ	T (°R)
550	1532.2	134	990	1000	2051	46	1800
560	1545.5	133	1000	1050	2082	53	1890
570	1558.5	130	1026	1100	2123	51	1980
580	1571.4	129	1044	1150	2169	46	2070
590	1584.4	130	1062	1200	2214	45	2160
600	1597	13	1080	1250	2258	44	2250
610	1609	12	1098	1300	2299	41	2340
620	1622	13	1116	1350	2340	41	2430
630	1634	12	1134	1400	2380	40	2520
640	1646	12	1152	1450	2420	40	2610
650	1658	12	1170	1500	2459	39	2700
660	1670	12	1188	1550	2496	37	2790
670	1682	12	1206	1600	2533	37	2880
680	1694	12	1224	1650	2569	36	2970
690	1706	12	1242	1700	2603	34	3060
700	1716	12	1260	1750	2636	33	3150
710	1729	11	1278	1800	2669	33	3240
720	1741	12	1296	1850	2699	30	3330
730	1752	11	1314	1900	2727	28	3420
740	1764	12	1332	1950	2753	26	3510
750	1775	11	1350	2000	2776	23	3600
760	1786	11	1368	2050	2799	23	3690
770	1796	10	1386	2100	2820	21	3780
780	1807	11	1404				
790	1818	11	1422				

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
80	587.4										144
90	623.2	358				620.6					162
100	657.4	342				655.3	347				180
110	689.5	321				688.0	327				198
120	720.4	309				719.1	311				216
130	749.9	295				748.9	298				234
140	778.3	284				777.5	286				252
150	805.7	274				805.0	275				270
160	832.2	265				831.7	267				288
170	857.8	256				857.3	256				306
180	882.8	250				882.4	251				324
190	906.9	241				906.6	242				342
200	930.5	236				930.2	236				360
210	953.5	230				953.3	231				378
220	976.0	225				975.9	226				396
230	997.8	218				997.8	219				414
240	1019.2	214				1019.1	213				432
250	1040.2	210				1040.2	211				450
260	1060.8	206				1060.9	207				468
270	1081.0	202				1081.0	201				486
280	1100.7	197				1100.8	198				504
290	1120.1	194				1120.2	194				522
300	1139.2	191	1.	3.	10.	1139.3	191	1.	3.	10.	540
310	1157.9	187				1158.0	187				558
320	1176.4	185				1176.5	185				576
330	1194.4	180				1194.5	180				594
340	1212.3	179				1212.4	179				612
350	1229.7	174				1229.8	174				630
360	1247.0	173				1247.2	174				648
370	1263.9	169				1264.1	169				666
380	1280.6	167				1280.8	167				684
390	1297.1	165				1297.3	165				702
400	1313.3	162	1.	3.	11.	1313.5	162	1.	3.	11.	720
410	1329.3	160				1329.5	160				738
420	1344.9	156				1345.2	157				756
430	1360.6	157				1360.8	156				774
440	1375.9	153				1376.1	153				792
450	1391.0	151				1391.3	152				810
460	1405.9	149				1406.2	149				828
470	1420.6	147				1420.8	146				846
480	1435.2	146				1435.4	146				864
490	1449.5	143				1449.8	144				882
500	1463.8	143	1.	3.	12.	1464.0	142	1.	3.	12.	900
510	1477.8	140				1478.0	140				918
520	1491.6	138				1491.8	138				936
530	1505.3	137				1505.5	137				954
540	1518.9	136				1519.1	136				972

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure		a Residuals, for mole % moisture content			1.0 Atmosphere Pressure		a Residuals, for mole % moisture content			T (°R)
	a	Δ	0.1	1.0	5.0	a	Δ	0.1	1.0	5.0	
90	617.9					615.1					162
100	653.1	352				651.0	359				180
110	686.4	333				684.6	336				198
120	717.8	314				716.5	319				216
130	747.8	300				746.8	303				234
140	776.6	288				775.8	290				252
150	804.4	278				803.7	279				270
160	831.1	267				830.6	269				288
170	856.9	258				856.4	258				306
180	882.0	251				881.7	253				324
190	906.3	243				906.0	243				342
200	930.0	237				929.8	238				360
210	953.2	232				953.0	232				378
220	975.8	226				975.6	226				396
230	997.7	219				997.7	221				414
240	1019.1	214				1019.0	213				432
250	1040.3	212				1040.3	213				450
260	1060.9	206				1061.0	207				468
270	1081.1	202				1081.2	202				486
280	1100.8	197				1100.9	197				504
290	1120.3	195				1120.4	195				522
300	1139.4	191	2.	2.	10.	1139.5	191	2.	2.	10.	540
310	1158.1	187				1158.3	188				558
320	1176.6	185				1176.7	184				576
330	1194.7	181				1195.0	183				594
340	1212.5	178				1212.7	177				612
350	1229.9	174				1230.2	175				630
360	1247.3	174				1247.4	172				648
370	1264.2	169				1264.5	171				666
380	1280.9	167				1281.2	167				684
390	1297.4	165				1297.6	164				702
400	1313.6	162	1.	2.	11.	1313.8	162	1.	2.	11.	720
410	1329.6	160				1329.8	160				738
420	1345.3	157				1345.7	159				756
430	1360.9	156				1361.2	155				774
440	1376.3	154				1376.6	154				792
450	1391.5	152				1391.7	151				810
460	1406.4	149				1406.6	149				828
470	1421.1	147				1421.3	147				846
480	1435.6	145				1435.8	145				864
490	1450.0	144				1450.2	144				882
500	1464.2	142	1.	2.	12.	1464.4	142	1.	2.	12.	900
510	1478.3	141				1478.5	141				918
520	1492.1	138				1492.4	139				936
530	1505.8	137				1506.1	137				954
540	1519.4	136				1519.6	135				972

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
550	1532.3	134				1532.5	134				990
560	1545.6	133				1545.8	133				1008
570	1558.6	130				1558.8	130				1026
580	1571.6	130				1571.8	130				1044
590	1584.5	129				1584.7	129				1062
600	1597	13	1	3	12	1597	12	2	3	12	1080
610	1609	12				1610	13				1098
620	1622	13				1622	12				1116
630	1634	12				1634	12				1134
640	1646	12				1647	13				1152
650	1659	13				1659	12				1170
660	1671	12				1671	12				1188
670	1682	11				1683	12				1206
680	1694	12				1695	12				1224
690	1706	12				1706	11				1242
700	1718	12	2	2	14	1718	12	1	3	14	1260
710	1729	11				1730	12				1278
720	1741	12				1741	11				1296
730	1752	11				1752	11				1314
740	1764	12				1764	12				1332
750	1775	11				1775	11				1350
760	1786	11				1786	11				1368
770	1796	10				1796	10				1386
780	1807	11				1808	12				1404
790	1818	11				1819	11				1422
800	1829	11	1	3	14	1830	11	1	3	14	1440
850	1882	53				1882	52				1530
900	1933	51	1	3	14	1933	51	1	2	15	1620
950	1983	50				1983	50				1710
1000	2031	48	1	3	15	2032	49	2	3	15	1800
1050	2079	48				2079	47				1890
1100	2125	46	2	3	16	2125	46	2	3	16	1980
1150	2169	44				2171	46				2070
1200	2214	45	1	3	15	2214	43	1	3	16	2160
1250	2258	44				2258	44				2250
1300	2299	41	1	2	16	2300	42	2	3	17	2340
1350	2340	41				2340	40				2430
1400	2380	40	2	4	17	2380	40	1	4	17	2520
1450	2420	40				2420	40				2610
1500	2459	39	0	4	16	2459	39	2	4	17	2700
1550	2497	38				2497	38				2790
1600	2534	37	1	2	17	2534	37	1	2	17	2880
1650	2570	36				2571	37				2970
1700	2605	35	2	3	15	2607	36	0	1	15	3060
1750	2640	35				2641	34				3150

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
550	1532.7	133				1533.1	135				990
560	1546.0	133				1546.2	131				1008
570	1559.0	130				1559.4	132				1026
580	1572.0	130				1572.3	129				1044
590	1584.9	129				1585.1	128				1062
600	1597	12	2	3	12	1597	12	2	3	12	1080
610	1610	13				1610	13				1098
620	1622	12				1622	12				1116
630	1635	13				1635	13				1134
640	1647	12				1647	12				1152
650	1659	12				1659	12				1170
660	1671	12				1671	12				1188
670	1683	12				1683	12				1206
680	1695	12				1695	12				1224
690	1707	12				1707	12				1242
700	1718	11	2	3	14	1718	11	2	3	14	1260
710	1730	12				1730	12				1278
720	1741	11				1742	12				1296
730	1753	12				1753	11				1314
740	1764	11				1764	11				1332
750	1775	11				1776	12				1350
760	1787	12				1787	11				1368
770	1798	11				1798	11				1386
780	1808	10				1808	10				1404
790	1819	11				1819	11				1422
800	1830	11	2	3	14	1830	11	2	3	14	1440
850	1882	52				1883	53				1530
900	1935	53	1	3	15	1935	52	1	3	15	1620
950	1983	48				1985	50				1710
1000	2032	49	2	3	15	2032	47	2	3	15	1800
1050	2079	47				2079	47				1890
1100	2125	46	2	3	16	2126	47	2	3	16	1980
1150	2171	46				2171	45				2070
1200	2214	43	2	3	16	2215	44	2	3	16	2160
1250	2258	44				2258	43				2250
1300	2300	42	2	4	17	2300	42	2	4	17	2340
1350	2340	40				2341	41				2430
1400	2380	40	1	4	17	2381	40	1	4	17	2520
1450	2421	41				2421	40				2610
1500	2459	38	2	4	18	2459	38	2	4	18	2700
1550	2497	38				2497	38				2790
1600	2535	38	1	3	16	2535	38	1	3	16	2880
1650	2571	36				2571	36				2970
1700	2607	36	0	1	16	2608	37	0	1	16	3060
1750	2642	35				2642	34				3150

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.1 Atmosphere Pressure					0.4 Atmosphere Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2674	34	1	2	12	2676	35	1	2	14	3240
1850	2708	34				2709	33				3330
1900	2738	30	- 1	- 1	10	2741	32	0	0	12	3420
1950	2769	31				2773	32				3510
2000	2799	30	- 2	- 1	8	2804	31	- 1	0	12	3600
2050	2827	28				2833	29				3690
2100	2853	26	- 4	- 3	3	2862	29	- 1	- 2	9	3780
2150	2880	27				2889	27				3870
2200	2903	23	- 4	- 4	3	2918	29	- 2	- 2	7	3960
2250	2927	24				2944	26				4050
2300	2951	24	- 3	- 4	3	2969	25	- 4	- 3	4	4140
2350	2974	23				2994	25				4230
2400	2997	23	- 4	- 4	4	3019	25	- 3	- 4	4	4320
2450	3020	23				3042	23				4410
2500	3042	22	- 1	- 1	12	3064	22	- 3	- 3	6	4500
2550	3065	23				3088	24				4590
2600	3090	25	1	3	19	3112	24	- 1	0	10	4680
2650	3118	28				3138	26				4770
2700	3147	29	4	6	31	3163	25	1	1	16	4860
2750	3179	32				3189	26				4950
2800	3211	32	7	11	45	3217	28	2	4	24	5040
2850	3247	36				3246	29				5130
2900	3285	38	7	14	58	3276	30	4	8	32	5220
2950	3324	39				3308	32				5310
3000	3366	42	13	20	79	3339	31	8	11	47	5400
3100	3454	88	13			3408	69	8	16	61	5580
3200	3546	92				3486	78	9	20	78	5760
3300						3569	83	12	22	94	5940
3400						3658	89	15	30	111	6120
3500						3748	90	15	29	125	6300
3600						3838	90	19	29	141	6480
3700						3927	89	15	32	149	6660
3800						4011	84	17	36	167	6840
3900						4091	80	15	35	173	7020
4000						4168	77	19	43	187	7200
4100						4244	76	14	35	187	7380
4200						4321	77	19	39	194	7560
4300						4404	83	19	40	197	7740
4400						4494	90	22	37	196	7920
4500						4592	98	21	42	199	8100
4600						4699	107	20	40	203	8280
4700						4816	117	19	39	202	8460
4800						4941	125	18	37	200	8640
4900						5076	135	21	41	196	8820
5000						5221	145	25	38	187	9000

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	0.7 Atmosphere Pressure					1.0 Atmosphere Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2676	34	1	2	15	2676	34	1	2	15	3240
1850	2710	34				2710	34				3330
1900	2742	32	1	1	13	2744	34	1	1	13	3420
1950	2774	32				2775	31				3510
2000	2806	32	- 1	0	12	2807	32	- 1	0	13	3600
2050	2835	29				2836	29				3690
2100	2864	29	0	- 1	10	2866	30	0	- 1	11	3780
2150	2895	31				2897	31				3870
2200	2923	28	- 1	- 2	8	2926	29	- 1	- 2	9	3960
2250	2950	27				2955	29				4050
2300	2976	26	- 4	- 3	6	2981	26	- 3	- 3	7	4140
2350	3001	25				3007	26				4230
2400	3027	26	- 2	- 3	5	3033	26	- 2	- 3	6	4320
2450	3051	24				3057	24				4410
2500	3074	23	- 3	3	6	3080	23	- 3	- 3	6	4500
2550	3098	24				3104	24				4590
2600	3122	24	- 2	- 2	8	3127	23	- 2	- 3	8	4680
2650	3146	24				3151	24				4770
2700	3170	24	1	0	13	3175	24	0	- 1	11	4860
2750	3196	26				3200	25				4950
2800	3221	25	1	3	20	3225	25	0	2	18	5040
2850	3248	27				3251	26				5130
2900	3276	28	4	6	27	3279	28	4	5	25	5220
2950	3305	29				3306	27				5310
3000	3334	29	6	9	36	3334	28	4	8	31	5400
3100	3399	65	7	12	51	3396	62	7	10	45	5580
3200	3470	71	8	17	64	3463	67	8	15	56	5760
3300	3546	76	12	22	78	3535	72	12	21	69	5940
3400	3629	83	13	25	95	3513	78	12	22	85	6120
3500	3714	85	14	27	110	3695	82	13	25	101	6300
3600	3802	88	16	26	124	3780	85	14	24	113	6480
3700	3889	87	14	30	137	3865	85	13	29	128	6660
3800	3975	86	16	33	154	3951	86	16	30	144	6840
3900	4057	82	16	32	164	4034	83	16	31	156	7020
4000	4136	79	18	38	177	4114	80	18	35	169	7200
4100	4213	77	15	35	181	4193	79	17	36	175	7380
4200	4289	76	17	37	189	4269	76	17	36	185	7560
4300	4367	78	20	40	195	4347	78	20	39	192	7740
4400	4449	82	21	38	196	4425	78	20	38	194	7920
4500	4536	87	21	41	199	4508	83	20	40	199	8100
4600	4632	96	21	41	204	4597	89	21	42	204	8280
4700	4735	103	19	39	203	4692	95	20	40	203	8460
4800	4846	111	19	39	203	4794	102	20	41	204	8640
4900	4966	120	21	42	201	4905	111	21	41	203	8820
5000	5097	131	23	42	192	5024	119	21	42	196	9000

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
90	615.1										162
100	651.0	359									180
110	684.6	336				667.2					198
120	716.5	319				702.9	357				216
130	746.8	303				736.2	333				234
140	775.8	290				767.3	311				252
150	803.7	279				797.0	297				270
160	830.6	269				825.3	283				288
170	856.4	258				852.3	270				306
180	881.7	253				878.5	262				324
190	906.0	243				903.4	249				342
200	929.8	238				927.8	244				360
210	953.0	232				951.6	238				378
220	975.6	226				974.8	232				396
230	997.7	221				997.3	225				414
240	1019.0	213				1018.8	215				432
250	1040.3	213				1040.3	215				450
260	1061.0	207				1061.3	210				468
270	1081.2	202				1081.9	206				486
280	1100.9	197				1101.9	200				504
290	1120.4	195				1121.5	196				522
300	1139.5	191	2.	2.	10.	1140.7	192	1.	1.	8.	540
310	1158.3	188				1159.6	189				558
320	1176.7	184				1178.1	185				576
330	1195.0	183				1196.5	184				594
340	1212.7	177				1214.3	178				12
350	1230.2	175				1231.9	176				630
360	1247.4	172				1249.2	173				648
370	1264.5	171				1266.3	171				666
380	1281.2	167				1283.2	169				684
390	1297.6	164				1299.6	164				702
400	1313.8	162	1.	2.	11.	1315.9	163	1.	2.	11.	720
410	1329.8	160				1331.9	160				738
420	1345.7	159				1347.8	159				756
430	1361.2	155				1363.4	156				774
440	1376.6	154				1378.8	154				792
450	1391.7	151				1393.9	151				810
460	1406.6	149				1408.9	150				828
470	1421.3	147				1423.6	147				846
480	1435.8	145				1438.2	146				864
490	1450.2	144				1452.6	144				882
500	1464.4	142	1.	2.	12.	1466.8	142	1.	2.	12.	900
510	1478.5	141				1480.9	141				918
520	1492.4	139				1494.8	139				936
530	1506.1	137				1508.5	137				954
540	1519.6	135				1522.0	135				972

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
110	648.1					626.6					198
120	688.7	406				673.2	466				216
130	725.1	364				713.7	405				234
140	758.7	336				750.0	363				252
150	790.2	315				783.5	335				270
160	819.9	287				814.7	312				288
170	848.2	293				844.2	295				306
180	875.4	272				872.1	279				324
190	901.0	256				898.8	267				342
200	925.9	249				924.3	255				360
210	950.4	245				949.2	249				378
220	974.0	236				973.2	240				396
230	996.8	228				996.5	233				414
240	1018.8	220				1019.1	226				432
250	1040.7	219				1041.1	220				450
260	1061.8	211				1062.5	214				468
270	1082.4	206				1083.4	209				486
280	1102.7	203				1103.9	205				504
290	1122.6	199				1123.9	200				522
300	1142.0	194	0	1.	8.	1143.3	194	0	1.	9.	540
310	1160.9	189				1162.5	192				558
320	1179.6	187				1181.3	188				576
330	1198.0	184				1199.7	184				594
340	1216.0	180				1217.7	180				612
350	1233.8	178				1235.5	178				630
360	1251.1	173				1253.0	175				648
370	1268.3	172				1270.2	172				666
380	1285.1	168				1287.2	170				684
390	1301.7	166				1303.8	166				702
400	1318.0	163	1.	2.	11.	1320.1	163	1.	2.	11.	720
410	1334.1	161				1336.2	161				738
420	1349.9	158				1352.1	159				756
430	1365.6	157				1367.8	157				774
440	1381.0	154				1383.2	154				792
450	1396.2	152				1398.4	152				810
460	1411.2	150				1413.4	150				828
470	1425.9	147				1428.2	148				846
480	1440.6	147				1442.9	147				864
490	1455.0	144				1457.3	144				882
500	1469.2	142	1.	3.	12.	1471.5	142	2.	3.	12.	900
510	1483.3	141				1485.6	141				918
520	1497.2	139				1499.6	140				936
530	1510.9	137				1513.3	137				954
540	1524.4	135				1526.9	136				972

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
550	1533.1	135				1535.5	135				990
560	1546.2	131				1548.6	131				1008
570	1559.4	132				1561.8	132				1026
580	1572.3	129				1574.7	129				1044
590	1585.1	128				1587.5	128				1062
600	1597	12	2	3	12	1601	13	1	3	13	1080
610	1610	13				1613	12				1098
620	1622	12				1626	13				1116
630	1635	13				1638	12				1134
640	1647	12				1650	12				1152
650	1659	12				1662	12				1170
660	1671	12				1674	12				1188
670	1683	12				1686	12				1206
680	1695	12				1697	11				1224
690	1707	12				1709	12				1242
700	1718	11	2	3	14	1721	12	2	3	13	1260
710	1730	12				1732	11				1278
720	1742	12				1744	12				1296
730	1753	11				1755	11				1314
740	1764	11				1767	12				1332
750	1776	12				1778	11				1350
760	1787	11				1789	11				1368
770	1798	11				1800	11				1386
780	1808	10				1811	11				1404
790	1819	11				1821	10				1422
800	1830	11	2	3	14	1832	11	1	3	14	1440
850	1883	53				1886	54				1530
900	1935	52	1	3	15	1937	51	1	3	14	1620
950	1985	50				1987	50				1710
1000	2032	47	2	3	15	2035	48	2	3	16	1800
1050	2079	47				2081	46				1890
1100	2126	47	2	3	16	2128	47	2	4	15	1980
1150	2171	45				2173	45				2070
1200	2215	44	2	3	16	2216	43	2	4	16	2160
1250	2258	43				2260	44				2250
1300	2300	42	2	4	17	2302	42	1	3	17	2340
1350	2341	41				2342	40				2430
1400	2381	40	1	4	17	2383	41	2	4	17	2520
1450	2421	40				2423	40				2610
1500	2459	38	2	4	18	2461	38	1	4	18	2700
1550	2497	38				2499	38				2790
1600	2535	38	1	3	16	2536	37	2	3	17	2880
1650	2571	36				2573	37				2970
1700	2608	37	0	1	16	2609	36	2	3	17	3060
1750	2642	34				2644	35				3150

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure		a Residuals, for mole % moisture content			10.0 Atmospheres Pressure		a Residuals, for mole % moisture content			T (°R)
	a	Δ	0.1	1.0	5.0	a	Δ	0.1	1.0	5.0	
550	1537.8	134				1540.2	133				990
560	1551.0	132				1553.4	132				1008
570	1564.2	132				1566.6	132				1026
580	1577.1	129				1579.5	129				1044
590	1589.9	128				1592.3	128				1062
600	1603	13	1	3	12	1605	13	1	3	12	1080
610	1616	13				1618	13				1098
620	1628	12				1630	12				1116
630	1640	12				1643	13				1134
640	1653	13				1655	12				1152
650	1665	12				1667	12				1170
660	1677	12				1679	12				1188
670	1689	12				1691	12				1206
680	1701	12				1703	12				1224
690	1713	12				1715	12				1242
700	1725	12	2	3	13	1726	11	2	3	13	1260
710	1736	11				1738	12				1278
720	1746	10				1749	11				1296
730	1757	11				1761	12				1314
740	1769	12				1771	10				1332
750	1780	11				1782	11				1350
760	1791	11				1793	11				1368
770	1802	11				1805	12				1386
780	1813	11				1816	11				1404
790	1824	11				1827	11				1422
800	1834	10	1	3	14	1838	11	1	3	14	1440
850	1888	54				1890	52				1530
900	1939	51	1	3	14	1941	51	1	3	14	1620
950	1989	50				1991	50				1710
1000	2037	48	2	3	16	2039	48	2	3	15	1800
1050	2084	47				2086	47				1890
1100	2130	46	2	3	15	2132	46	2	3	15	1980
1150	2175	45				2177	45				2070
1200	2218	43	2	4	16	2221	44	2	4	16	2160
1250	2262	44				2264	43				2250
1300	2303	41	2	3	17	2305	41	2	3	17	2340
1350	2344	41				2347	42				2430
1400	2385	41	2	4	17	2387	40	1	4	17	2520
1450	2424	39				2426	39				2610
1500	2463	39	1	4	17	2465	39	1	4	17	2700
1550	2501	38				2502	37				2790
1600	2538	37	1	3	18	2539	37	1	3	18	2880
1650	2575	37				2576	37				2970
1700	2611	36	2	3	17	2612	36	2	4	17	3060
1750	2646	35				2648	36				3150

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	1.0 Atmosphere Pressure					4.0 Atmospheres Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2676	34	1	2	15	2679	35	1	4	16	3240
1850	2710	34				2713	34				3330
1900	2744	34	1	1	13	2747	34	1	2	15	3420
1950	2775	31				2779	32				3510
2000	2807	32	- 1	0	13	2811	32	- 1	1	15	3600
2050	2836	29				2843	32				3690
2100	2866	30	0	- 1	11	2873	30	1	1	13	3780
2150	2897	31				2905	32				3870
2200	2926	29	- 1	- 2	9	2935	30	- 1	- 1	11	3960
2250	2955	29				2963	28				4050
2300	2981	26	- 3	- 3	7	2993	30	- 2	- 1	11	4140
2350	3007	26				3020	27				4230
2400	3033	26	- 2	- 3	6	3047	27	- 2	- 2	9	4320
2450	3057	24				3073	26				4410
2500	3080	23	- 3	- 3	6	3098	25	- 3	- 1	7	4500
2550	3104	24				3123	25				4590
2600	3127	23	- 2	- 3	8	3148	25	- 1	- 3	8	4680
2650	3151	24				3173	25				4770
2700	3175	24	0	- 1	11	3197	24	- 1	- 1	9	4860
2750	3200	25				3222	25				4950
2800	3225	25	0	2	18	3246	24	- 1	0	12	5040
2850	3251	26				3271	25				5130
2900	3279	28	4	5	25	3295	24	1	1	14	5220
2950	3306	27				3320	25				5310
3000	3334	28	4	8	31	3345	25	2	4	18	5400
3100	3396	62	7	10	45	3401	56	5	5	25	5580
3200	3463	67	8	15	56	3456	55	6	7	33	5760
3300	3535	72	12	21	69	3515	59	8	13	42	5940
3400	3613	78	12	22	85	3578	63	7	13	54	6120
3500	3695	82	13	25	101	3645	67	10	18	65	6300
3600	3780	85	14	24	113	3716	71	8	18	74	6480
3700	3865	85	13	29	128	3790	74	13	21	92	6660
3800	3951	86	16	30	144	3868	78	12	22	103	6840
3900	4034	83	16	31	156	3947	79	16	25	117	7020
4000	4114	80	18	35	169	4028	81	16	25	129	7200
4100	4193	79	17	36	175	4108	80	16	33	141	7380
4200	4269	76	17	36	185	4187	79	16	32	154	7560
4300	4347	78	20	39	192	4265	78	19	35	166	7740
4400	4425	78	20	38	194	4341	76	17	37	174	7920
4500	4508	83	20	40	199	4416	75	19	36	184	8100
4600	4597	89	21	42	204	4493	77	21	41	190	8280
4700	4692	95	20	40	203	4569	76	19	43	195	8460
4800	4794	102	20	41	204	4648	79	22	43	202	8640
4900	4905	111	21	41	203	4730	82	20	37	203	8820
5000	5024	119	21	42	196	4815	85	20	38	207	9000

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	7.0 Atmospheres Pressure					10.0 Atmospheres Pressure					T (°R)
			a Residuals, for mole % moisture content					a Residuals, for mole % moisture content			
	a	Δ	0.1	1.0	5.0	a	Δ	0.1	1.0	5.0	
1800	2681	35	1	4	17	2683	35	1	4	17	3240
1850	2715	34				2716	33				3330
1900	2749	34	1	2	16	2750	34	1	2	16	3420
1950	2782	33				2784	34				3510
2000	2814	32	0	2	15	2816	32	0	2	16	3600
2050	2846	32				2848	32				3690
2100	2877	31	1	1	14	2880	32	0	1	14	3780
2150	2908	31				2910	30				3870
2200	2938	30	- 1	- 1	12	2940	30	- 1	- 1	13	3960
2250	2969	31				2970	30				4050
2300	2996	27	- 1	0	12	2998	28	- 1	0	13	4140
2350	3024	28				3026	28				4230
2400	3051	27	- 2	- 2	10	3054	28	- 2	- 2	10	4320
2450	3077	26				3081	27				4410
2500	3105	28	- 3	- 1	8	3108	27	- 3	- 1	9	4500
2550	3131	26				3135	27				4590
2600	3156	25	- 1	- 2	9	3161	26	- 1	- 2	10	4680
2650	3182	26				3187	26				4770
2700	3207	25	- 2	- 2	10	3213	26	- 2	- 2	10	4860
2750	3232	25				3239	26				4950
2800	3257	25	- 1	- 1	10	3264	25	- 1	- 1	10	5040
2850	3281	24				3289	25				5130
2900	3306	25	0	0	11	3313	24	- 1	- 1	9	5220
2950	3331	25				3338	25				5310
3000	3355	24	2	2	16	3362	24	1	2	15	5400
3100	3408	53	4	4	20	3413	51	3	3	17	5580
3200	3461	53	5	5	27	3465	52	4	4	25	5760
3300	3516	55	5	9	35	3519	54	3	7	31	5940
3400	3574	58	5	11	44	3574	55	4	11	40	6120
3500	3636	62	9	15	52	3634	60	8	13	46	6300
3600	3702	66	8	16	62	3696	62	7	15	56	6480
3700	3770	68	13	18	78	3761	65	12	16	69	6660
3800	3843	73	11	20	88	3830	69	10	19	78	6840
3900	3918	75	14	24	100	3902	72	13	22	89	7020
4000	3995	77	14	24	112	3976	74	13	23	102	7200
4100	4073	78	14	29	124	4051	75	12	27	113	7380
4200	4150	77	15	29	138	4128	77	15	27	126	7560
4300	4228	78	17	33	149	4204	76	16	31	138	7740
4400	4304	76	16	35	160	4280	76	15	34	149	7920
4500	4380	76	19	34	172	4356	76	18	33	162	8100
4600	4455	75	20	38	178	4431	75	19	36	169	8280
4700	4529	74	18	41	186	4505	74	17	39	162	8460
4800	4605	76	21	41	195	4579	74	20	38	188	8640
4900	4681	76	21	37	199	4652	73	21	37	195	8820
5000	4758	77	21	37	204	4728	76	22	38	200	9000

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
110	626.6										198
120	673.2	466									216
130	713.7	405									234
140	750.0	363									252
150	783.5	335				714.9					270
160	814.7	312				767.7	528				288
170	844.2	295				811.4	437				306
180	872.1	279				849.6	382				324
190	898.8	267				884.1	345				342
200	924.3	255				916.2	321				360
210	949.2	249				945.6	294				378
220	973.2	240				973.6	280				396
230	996.5	233				1000.2	266				414
240	1019.1	226				1025.6	254				432
250	1041.1	220				1049.9	243				450
260	1062.5	214				1073.4	235				468
270	1083.4	209				1096.1	227				486
280	1103.9	205				1118.1	220				504
290	1123.9	200				1139.2	211				522
300	1143.3	194	0	1.	9.	1160.1	209				540
310	1162.5	192				1180.4	203				558
320	1181.3	188				1200.1	197				576
330	1199.7	184				1219.3	192				594
340	1217.7	180				1238.0	187				612
350	1235.5	178				1256.4	184				630
360	1253.0	175				1274.5	181				648
370	1270.2	172				1292.2	177				666
380	1287.2	170				1309.5	173				684
390	1303.8	166				1326.4	169				702
400	1320.1	163	1.	2.	11.	1343.1	167				720
410	1336.2	161				1359.6	165				738
420	1352.1	159				1375.7	161				756
430	1367.8	157				1391.6	159				774
440	1383.2	154				1407.1	155				792
450	1398.4	152				1422.4	153				810
460	1413.4	150				1437.6	152				828
470	1428.2	148				1452.6	150				846
480	1442.9	147				1467.4	148				864
490	1457.3	144				1481.9	145				882
500	1471.5	142	2.	3.	12.	1496.2	143	2.	3.	11.	900
510	1485.6	141				1510.3	141				918
520	1499.6	140				1524.4	141				936
530	1513.3	137				1538.1	137				954
540	1526.9	136				1551.5	134				972

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
180	868.6										324
190	901.9	333									342
200	934.4	325				990.2					360
210	963.8	294				1010.3	201				378
220	992.5	287				1034.1	238				396
230	1019.9	274				1058.3	242				414
240	1046.1	262				1082.1	238				432
250	1071.1	250				1105.5	234				450
260	1095.3	242				1128.5	230				468
270	1118.6	233				1150.9	224				486
280	1141.0	224				1172.7	218				504
290	1162.8	218				1193.9	212				522
300	1184.0	212				1214.7	208				540
310	1204.5	205				1234.9	202				558
320	1224.6	201				1254.6	197				576
330	1244.0	194				1273.9	193				594
340	1263.0	190				1292.7	188				612
350	1281.8	188				1311.0	183				630
360	1299.9	181				1329.3	183				648
370	1317.7	178				1347.0	177				666
380	1335.1	174				1364.2	172				684
390	1352.3	172				1381.1	169				702
400	1369.1	168				1397.6	165				720
410	1385.4	163				1413.9	163				738
420	1401.5	161				1429.6	157				756
430	1417.4	159				1445.4	158				774
440	1433.0	156				1460.9	155				792
450	1448.5	155				1476.6	157				810
460	1463.7	152				1491.3	147				828
470	1478.7	150				1506.3	150				846
480	1493.3	146				1520.9	146				864
490	1507.8	145				1535.3	144				882
500	1522.2	144				1549.5	142				900
510	1536.2	140				1563.4	139				918
520	1550.2	140				1577.1	137				936
530	1563.9	137				1590.7	136				954
540	1577.4	135				1604.2	135				972

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
			a Residuals, for mole % moisture content					a Residuals, for mole % moisture content			
	a	Δ	0.1	1.0	5.0	a	Δ	0.1	1.0	5.0	
550	1540.2	133				1565.0	135				990
560	1553.4	132				1578.3	133				1008
570	1566.6	132				1591.5	132				1026
580	1579.5	129				1604.4	129				1044
590	1592.3	128				1617.2	128				1062
600	1605	13	1	3	12	1630	13	1	2	10	1080
610	1618	13				1642	12				1098
620	1630	12				1654	12				1116
630	1643	13				1667	13				1134
640	1655	12				1679	12				1152
650	1667	12				1691	12				1170
660	1679	12				1703	12				1188
670	1691	12				1715	12				1206
680	1703	12				1727	12				1224
690	1715	12				1739	12				1242
700	1726	11	2	3	13	1750	11	0	2	11	1260
710	1738	12				1762	12				1278
720	1749	11				1773	11				1296
730	1761	12				1783	10				1314
740	1771	10				1794	11				1332
750	1782	11				1806	12				1350
760	1793	11				1817	11				1368
770	1805	12				1828	11				1386
780	1816	11				1839	11				1404
790	1827	11				1850	11				1422
800	1838	11	1	3	14	1861	11	1	2	12	1440
850	1890	52				1914	53				1530
900	1941	51	1	3	14	1965	51	1	2	13	1620
950	1991	50				2014	49				1710
1000	2039	48	2	3	15	2062	48	1	2	13	1800
1050	2086	47				2109	47				1890
1100	2132	46	2	3	15	2153	44	2	2	14	1980
1150	2177	45				2198	45				2070
1200	2221	44	2	4	16	2241	43	2	3	15	2160
1250	2264	43				2284	43				2250
1300	2305	41	2	3	17	2326	42	2	3	15	2340
1350	2347	42				2366	40				2430
1400	2387	40	1	4	17	2406	40	1	3	15	2520
1450	2426	39				2446	40				2610
1500	2465	39	1	4	17	2484	38	3	3	16	2700
1550	2502	37				2522	38				2790
1600	2539	37	1	3	18	2558	36	2	3	16	2880
1650	2576	37				2594	36				2970
1700	2612	36	2	4	17	2629	35	1	3	16	3060
1750	2648	36				2666	37				3150

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			a Residuals, for mole % moisture content					a Residuals, for mole % moisture content			
	a	Δ	0.1	1.0	5.0	a	Δ	0.1	1.0	5.0	
550	1590.7	133				1617.4	132				990
560	1604.0	133				1630.5	131				1008
570	1617.0	130				1643.4	129				1026
580	1629.9	129				1656.2	128				1044
590	1642.8	129				1668.8	126				1062
600	1655	12				1681	12				1080
610	1667	12				1693	12				1098
620	1680	13				1706	13				1116
630	1692	12				1718	12				1134
640	1704	12				1730	12				1152
650	1716	12				1742	12				1170
660	1728	12				1754	12				1188
670	1740	12				1765	11				1206
680	1752	12				1777	12				1224
690	1764	12				1788	11				1242
700	1775	11				1800	12				1260
710	1786	11				1811	11				1278
720	1796	10				1821	10				1296
730	1808	12				1833	12				1314
740	1819	11				1844	11				1332
750	1830	11				1855	11				1350
760	1841	11				1866	11				1368
770	1852	11				1877	11				1386
780	1863	11				1887	10				1404
790	1874	11				1898	11				1422
800	1885	11	1	2	10	1907	9				1440
850	1937	52				1960	53				1530
900	1987	50	1	2	11	2008	48				1620
950	2036	49				2057	49				1710
1000	2084	48	1	2	11	2105	48				1800
1050	2129	45				2151	46				1890
1100	2175	46	2	2	12	2197	46	1	3	11	1980
1150	2219	44				2240	43				2070
1200	2262	43	2	3	13	2284	44	2	2	12	2160
1250	2304	42				2326	42				2250
1300	2346	42	2	3	14	2367	41	2	3	13	2340
1350	2388	42				2408	41				2430
1400	2426	38	1	2	14	2447	39	1	2	12	2520
1450	2465	39				2486	39				2610
1500	2504	39	3	3	15	2524	38	3	3	14	2700
1550	2541	37				2561	37				2790
1600	2577	36	2	3	14	2598	37	2	3	13	2880
1650	2613	36				2634	36				2970
1700	2649	36	1	2	14	2670	36	1	2	13	3060
1750	2685	36				2704	34				3150

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	10.0 Atmospheres Pressure					40.0 Atmospheres Pressure					T (°R)
	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	a	Δ	a Residuals, for mole % moisture content 0.1	1.0	5.0	
1800	2683	35	1	4	17	2703	37	1	2	16	3240
1850	2716	33				2739	36				3330
1900	2750	34	1	2	16	2774	35	2	3	17	3420
1950	2784	34				2808	34				3510
2000	2816	32	0	2	16	2840	32	1	2	16	3600
2050	2848	32				2873	33				3690
2100	2880	32	0	1	14	2905	32	0	2	15	3780
2150	2910	30				2935	30				3870
2200	2940	30	- 1	- 1	13	2964	29	- 1	0	14	3960
2250	2970	30				2995	31				4050
2300	2998	28	- 1	0	13	3024	29	- 1	1	14	4140
2350	3026	28				3052	28				4230
2400	3054	28	- 2	- 2	10	3081	29	- 1	- 1	12	4320
2450	3081	27				3109	28				4410
2500	3108	27	- 3	- 1	9	3137	28	- 1	- 1	11	4500
2550	3135	27				3166	29				4590
2600	3161	26	- 1	- 2	10	3193	27	- 1	- 1	11	4680
2650	3187	26				3220	27				4770
2700	3213	26	- 2	- 2	10	3248	28	- 1	- 1	11	4860
2750	3239	26				3274	26				4950
2800	3264	25	- 1	- 1	10	3300	26	0	- 1	9	5040
2850	3289	25				3326	26				5130
2900	3313	24	- 1	- 1	9	3350	24	- 1	- 1	8	5220
2950	3338	25				3375	25				5310
3000	3362	24	1	2	15	3398	23	- 1	1	12	5400
3100	3413	51	3	3	17	3443	45	2	3	15	5580
3200	3465	52	4	4	25	3494	51	1	3	15	5760
3300	3519	54	3	7	31	3543	49	1	4	21	5940
3400	3574	55	4	11	40	3594	51	2	7	26	6120
3500	3634	60	8	13	46	3647	53	7	7	29	6300
3600	3696	62	7	15	56	3700	53	7	9	35	6480
3700	3761	65	12	16	69	3755	55	7	12	41	6660
3800	3830	69	10	19	78	3812	57	8	16	49	6840
3900	3902	72	13	22	89	3871	59	8	17	58	7020
4000	3976	74	13	23	102	3932	61	9	17	66	7200
4100	4051	75	12	27	113	3996	64	8	19	74	7380
4200	4128	77	15	27	126	4061	65	13	20	83	7560
4300	4204	76	16	31	138	4129	68	12	23	94	7740
4400	4280	76	15	34	149	4198	69	13	26	104	7920
4500	4356	76	18	33	162	4269	71	15	27	118	8100
4600	4431	75	19	36	169	4341	72	16	26	126	8280
4700	4505	74	17	39	162	4413	72	13	30	137	8460
4800	4579	74	20	38	188	4484	71	14	29	146	8640
4900	4652	73	21	37	195	4554	70	17	34	159	8820
5000	4728	76	22	38	200	4628	74	15	34	164	9000

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Continued) (See Section 1500.3 for definition of residuals)

T (°K)	70.0 Atmospheres Pressure					100.0 Atmospheres Pressure					T (°R)
			a Residuals, for mole % moisture content					a Residuals, for mole % moisture content			
	a	Δ	0.1	1.0	5.0	a	Δ	0.1	1.0	5.0	
1800	2721	36	0	1	15	2738	34	0	0	14	3240
1850	2756	35				2772	34				3330
1900	2789	33	2	3	16	2806	34	2	3	15	3420
1950	2822	33				2838	32				3510
2000	2855	33	1	2	15	2870	32	1	2	14	3600
2050	2886	31				2900	30				3690
2100	2920	34	0	2	15	2933	33	0	2	14	3780
2150	2950	30				2963	30				3870
2200	2981	31	- 1	1	14	2994	31	0	1	13	3960
2250	3011	30				3024	30				4050
2300	3040	29	- 1	1	13	3054	30	- 1	1	12	4140
2350	3070	30				3083	29				4230
2400	3098	28	- 1	0	12	3111	28	0	0	12	4320
2450	3127	29				3139	28				4410
2500	3155	28	- 1	- 1	11	3168	29	- 1	- 2	10	4500
2550	3183	28				3195	27				4590
2600	3210	27	- 2	- 2	11	3222	27	- 2	- 2	10	4680
2650	3237	27				3249	27				4770
2700	3266	29	- 1	- 1	11	3276	27	0	0	10	4860
2750	3292	26				3304	28				4950
2800	3319	27	0	0	10	3330	26	0	0	10	5040
2850	3344	25				3356	26				5130
2900	3369	25	0	0	10	3381	25	1	0	11	5220
2950	3393	24				3405	24				5310
3000	3417	24	- 3	1	10	3428	23	- 4	1	9	5400
3100	3464	47	2	2	16	3483	55	2	2	16	5580
3200	3514	50	0	3	12	3533	50	- 1	4	10	5760
3300	3563	49	2	6	18	3581	48	3	6	16	5940
3400	3614	51	3	6	21	3632	51	3	4	19	6120
3500	3664	50	6	6	25	3682	50	6	6	24	6300
3600	3716	52	5	5	28	3733	51	4	4	24	6480
3700	3769	53	4	11	34	3785	52	2	10	29	6660
3800	3823	54	8	14	41	3838	53	8	13	37	6840
3900	3878	55	8	15	51	3892	54	8	13	48	7020
4000	3936	58	8	12	56	3949	57	8	9	50	7200
4100	3995	59	8	18	63	4005	56	9	18	57	7380
4200	4056	61	11	18	70	4063	58	10	16	62	7560
4300	4120	64	10	21	80	4124	61	10	19	72	7740
4400	4183	63	11	22	89	4184	60	10	20	80	7920
4500	4249	66	14	24	102	4246	62	12	22	92	8100
4600	4317	68	16	23	109	4312	66	16	22	100	8280
4700	4386	69	12	26	118	4377	65	12	25	107	8460
4800	4455	69	12	26	126	4444	67	11	24	114	8640
4900	4523	68	13	30	138	4511	67	10	27	124	8820
5000	4595	72	9	30	144	4581	70	4	27	131	9000

Table 1510.09 VELOCITY OF SOUND (a in ft/sec) for dry and moist air (Concluded) (See Section 1500.3 for definition of residuals)

1510.10 Viscosity

T (°K)	$\mu \times 10^7$	Δ	T (°R)	T (°K)	$\mu \times 10^7$	Δ	T (°R)	T (°K)	$\mu \times 10^7$	Δ	T (°R)
100	1.4472		180	500	5.577	79	900	900	8.139	54	1620
110	1.5941	1469	198	510	5.652	75	918	910	8.193	54	1638
120	1.7375	1434	216	520	5.727	75	936	920	8.247	54	1656
130	1.8776	1401	234	530	5.802	75	954	930	8.300	53	1674
140	2.0145	1369	252	540	5.878	76	972	940	8.354	54	1692
150	2.1482	1337	270	550	5.949	71	990	950	8.408	54	1710
160	2.2790	1308	288	560	6.021	72	1008	960	8.465	57	1728
170	2.4070	1280	306	570	6.093	72	1026	970	8.519	54	1746
180	2.5321	1251	324	580	6.164	71	1044	980	8.569	50	1764
190	2.6546	1225	342	590	6.232	68	1062	990	8.623	54	1782
200	2.7747	1201	360	600	6.301	69	1080	1000	8.673	50	1800
210	2.8922	1175	378	610	6.369	68	1098	1010	8.727	54	1818
220	3.0073	1151	396	620	6.437	68	1116	1020	8.781	54	1836
230	3.1202	1129	414	630	6.505	68	1134	1030	8.831	50	1854
240	3.2309	1107	432	640	6.573	68	1152	1040	8.881	50	1872
250	3.3399	1090	450	650	6.637	64	1170	1050	8.931	50	1890
260	3.4467	1068	468	660	6.702	65	1188	1060	8.981	50	1908
270	3.5513	1046	486	670	6.766	64	1206	1070	9.032	51	1926
280	3.656	105	504	680	6.831	65	1224	1080	9.082	50	1944
290	3.756	100	522	690	6.896	65	1242	1090	9.132	50	1962
300	3.856	100	540	700	6.960	64	1260	1100	9.182	50	1980
310	3.953	97	558	710	7.021	61	1278	1110	9.232	50	1998
320	4.050	97	576	720	7.085	64	1296	1120	9.279	47	2016
330	4.147	97	594	730	7.146	61	1314	1130	9.325	46	2034
340	4.240	93	612	740	7.211	65	1332	1140	9.376	51	2052
350	4.333	93	630	750	7.272	61	1350	1150	9.422	46	2070
360	4.423	90	648	760	7.333	61	1368	1160	9.469	47	2088
370	4.512	89	666	770	7.394	61	1386	1170	9.519	50	2106
380	4.598	86	684	780	7.455	61	1404	1180	9.566	47	2124
390	4.688	90	702	790	7.512	57	1422	1190	9.616	50	2142
400	4.774	86	720	800	7.569	57	1440	1200	9.662	46	2160
410	4.860	86	738	810	7.627	58	1458	1210	9.709	47	2178
420	4.942	82	756	820	7.688	61	1476	1220	9.756	47	2196
430	5.025	83	774	830	7.745	57	1494	1230	9.802	46	2214
440	5.107	82	792	840	7.802	57	1512	1240	9.845	43	2232
450	5.190	83	810	850	7.860	58	1530	1250	9.892	47	2250
460	5.268	78	828	860	7.917	57	1548	1260	9.938	46	2268
470	5.344	76	846	870	7.974	57	1566	1270	9.985	47	2286
480	5.423	79	864	880	8.028	54	1584	1280	10.031	46	2304
490	5.498	75	882	890	8.085	57	1602	1290	10.078	47	2322

Table 1510.10a COEFFICIENT OF ABSOLUTE VISCOSITY (μ in slugs/ft sec) for dry air

T (°K)	μ x10^7	Δ	T (°R)	T (°K)	μ x10^7	Δ	T (°R)	T (°K)	μ x10^7	Δ	T (°R)
1300	10.121	43	2340	1500	10.988	43	2700	1700	11.791	39	3060
1310	10.168	47	2358	1510	11.028	40	2718	1710	11.831	40	3078
1320	10.211	43	2376	1520	11.071	43	2736	1720	11.870	39	3096
1330	10.257	46	2394	1530	11.114	43	2754	1730	11.909	39	3114
1340	10.300	43	2412	1540	11.153	39	2772	1740	11.945	36	3132
1350	10.343	43	2430	1550	11.193	40	2790	1750	11.985	40	3150
1360	10.386	43	2448	1560	11.232	39	2808	1760	12.024	39	3168
1370	10.433	47	2466	1570	11.275	43	2826	1770	12.064	40	3186
1380	10.476	43	2484	1580	11.315	40	2844	1780	12.099	35	3204
1390	10.519	43	2502	1590	11.354	39	2862	1790	12.139	40	3222
1400	10.562	43	2520	1600	11.397	43	2880	1800	12.175	36	3240
1410	10.608	46	2538	1610	11.436	39	2898	1810	12.214	39	3258
1420	10.651	43	2556	1620	11.476	40	2916	1820	12.250	36	3276
1430	10.695	44	2574	1630	11.515	39	2934	1830	12.289	39	3294
1440	10.734	39	2592	1640	11.555	40	2952	1840	12.325	36	3312
1450	10.777	43	2610	1650	11.594	39	2970	1850	12.361	36	3330
1460	10.820	43	2628	1660	11.634	40	2988	1860	12.400	39	3348
1470	10.863	43	2646	1670	11.673	39	3006	1870	12.436	36	3366
1480	10.902	39	2664	1680	11.712	39	3024	1880	12.476	40	3384
1490	10.945	43	2682	1690	11.752	40	3042	1890	12.512	36	3402
								1900	12.547	35	3420

Conversion Factors for Coefficient of Absolute Viscosity (μ)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
μ x10^7	μ x10^7	lb_F sec ft^{-2}	1.00000
		slug ft^{-1} hr^{-1}	3600
with dimensions of slug ft^{-1} sec^{-1}		slug in^{-1} sec^{-1}	0.0833333
		lb_M ft^{-1} hr^{-1}	115,826
		lb_M ft^{-1} sec^{-1}	32.1740
		gm cm^{-1} sec^{-1}	478.801

Table 1510.10a COEFFICIENT OF ABSOLUTE VISCOSITY (μ in slugs/ft sec) for dry air (Concluded)

T (°K)	μ x10^7	μ Residuals, for mole % moisture content 0.1	1.0	5.0	T (°R)
100	1.466	-.002	-.004	-.029	180
150	2.168	-.006	-.011	-.046	270
200	2.792	-.004	-.008	-.046	360
273.16	3.601	-.005	-.009	-.042	491.69
300	3.866	-.004	-.008	-.040	540
400	4.783	-.002	-.004	-.025	720
500	5.593	.000	-.002	-.014	900
600	6.337	.000	.002	-.002	1080
800	7.686	.000	.002	.014	1440
1000	8.891	.006	.012	.035	1800
1200	9.944	.008	.014	.052	2160
1400	10.967	.004	.013	.061	2520
1600	11.978	.008	.019	.088	2880
2000	13.952	.010	.020	.083	3600
3000	18.139	.008	.013	094	5400
5000	25.209	.042	.062	.188	9000

Table 1510.10b COEFFICIENT OF ABSOLUTE VISCOSITY (μ in slugs/ft sec) for dry and moist air
(See Section 1500.3 for definition of residuals)

T (°K)	$\nu \times 10^4$	Δ	T (°R)	T (°K)	$\nu \times 10^4$	Δ	T (°R)	T (°K)	$\nu \times 10^4$	Δ	T (°R)
100	.2073		180	500	4.073	138	900	900	10.701	190	1620
110	.2523	450	198	510	4.211	138	918	910	10.892	191	1638
120	.3010	487	216	520	4.351	140	936	920	11.085	193	1656
130	.3533	523	234	530	4.492	141	954	930	11.279	194	1674
140	.4088	555	252	540	4.637	145	972	940	11.473	194	1692
150	.4677	589	270	550	4.781	144	990	950	11.669	196	1710
160	.5298	621	288	560	4.927	146	1008	960	11.866	197	1728
170	.5949	651	306	570	5.074	147	1026	970	12.065	199	1746
180	.6632	683	324	580	5.222	148	1044	980	12.265	200	1764
190	.7344	712	342	590	5.372	150	1062	990	12.466	201	1782
200	.8084	740	360	600	5.524	152	1080	1000	12.667	201	1800
210	.8851	767	378	610	5.677	153	1098	1010	12.873	206	1818
220	.9643	792	396	620	5.831	154	1116	1020	13.079	206	1836
230	1.0463	820	414	630	5.988	157	1134	1030	13.285	206	1854
240	1.1309	846	432	640	6.145	157	1152	1040	13.492	207	1872
250	1.2179	870	450	650	6.304	159	1170	1050	13.699	207	1890
260	1.3073	894	468	660	6.464	160	1188	1060	13.907	208	1908
270	1.3990	917	486	670	6.625	161	1206	1070	14.117	210	1926
280	1.494	95	504	680	6.788	163	1224	1080	14.329	212	1944
290	1.590	96	522	690	6.952	164	1242	1090	14.540	211	1962
300	1.688	98	540	700	7.117	165	1260	1100	14.753	213	1980
310	1.788	100	558	710	7.282	165	1278	1110	14.967	214	1998
320	1.891	103	576	720	7.451	169	1296	1120	15.182	215	2016
330	1.997	106	594	730	7.622	171	1314	1130	15.396	214	2034
340	2.104	107	612	740	7.794	172	1332	1140	15.610	214	2052
350	2.214	110	630	750	7.966	172	1350	1150	15.826	216	2070
360	2.326	112	648	760	8.141	175	1368	1160	16.044	218	2088
370	2.438	112	666	770	8.315	174	1386	1170	16.266	222	2106
380	2.553	115	684	780	8.491	176	1404	1180	16.489	223	2124
390	2.670	117	702	790	8.668	177	1422	1190	16.711	222	2142
400	2.788	118	720	800	8.845	177	1440	1200	16.934	223	2160
410	2.910	122	738	810	9.025	180	1458	1210	17.157	223	2178
420	3.031	121	756	820	9.208	183	1476	1220	17.380	223	2196
430	3.155	124	774	830	9.392	184	1494	1230	17.604	224	2214
440	3.283	128	792	840	9.576	184	1512	1240	17.830	226	2232
450	3.411	128	810	850	9.761	185	1530	1250	18.057	227	2250
460	3.540	129	828	860	9.946	185	1548	1260	18.286	229	2268
470	3.670	130	846	870	10.133	187	1566	1270	18.516	230	2286
480	3.801	131	864	880	10.322	189	1584	1280	18.747	231	2304
490	3.935	134	882	890	10.511	189	1602	1290	18.980	233	2322

Table 1510.10c COEFFICIENT OF KINEMATIC VISCOSITY (ν in ft^2/sec) for dry air

T (°K)	ν x10^4	Δ	T (°R)	T (°K)	ν x10^4	Δ	T (°R)	T (°K)	ν x10^4	Δ	T (°R)
1300	19.216	236	2340	1500	24.071	252	2700	1700	29.273	270	3060
1310	19.451	235	2358	1510	24.322	251	2718	1710	29.545	272	3078
1320	19.687	236	2376	1520	24.575	253	2736	1720	29.816	271	3096
1330	19.923	236	2394	1530	24.828	253	2754	1730	30.087	271	3114
1340	20.158	235	2412	1540	25.081	253	2772	1740	30.359	272	3132
1350	20.394	236	2430	1550	25.335	254	2790	1750	30.630	271	3150
1360	20.631	237	2448	1560	25.591	256	2808	1760	30.903	273	3168
1370	20.870	239	2466	1570	25.848	257	2826	1770	31.177	274	3186
1380	21.110	240	2484	1580	26.106	258	2844	1780	31.453	276	3204
1390	21.351	241	2502	1590	26.368	262	2862	1790	31.729	276	3222
1400	21.594	243	2520	1600	26.629	261	2880	1800	32.004	275	3240
1410	21.837	243	2538	1610	26.891	262	2898	1810	32.280	276	3258
1420	22.081	244	2556	1620	27.152	261	2916	1820	32.557	277	3276
1430	22.327	246	2574	1630	27.413	261	2934	1830	32.836	279	3294
1440	22.574	247	2592	1640	27.675	262	2952	1840	33.116	280	3312
1450	22.821	247	2610	1650	27.938	263	2970	1850	33.397	281	3330
1460	23.069	248	2628	1660	28.202	264	2988	1860	33.679	282	3348
1470	23.318	249	2646	1670	28.468	266	3006	1870	33.961	282	3366
1480	23.568	250	2664	1680	28.735	267	3024	1880	34.246	285	3384
1490	23.819	251	2682	1690	29.003	268	3042	1890	34.530	284	3402
								1900	34.816	286	3420

Conversion Factors for Coefficient of Kinematic Viscosity (ν)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
ν x10^4 with dimensions $ft^2\ sec^{-1}$	ν x10^4	$in^2\ sec^{-1}$	144
		$cm^2\ sec^{-1}$	929.034
		$m^2\ hr^{-1}$	334.452

Table 1510.10c COEFFICIENT OF KINEMATIC VISCOSITY (ν in ft^2/sec) for dry air (Concluded)

1510.11 Thermal Conductivity (dry air)

T (°K)	k	Δ	T (°R)	T (°K)	k	Δ	T (°R)	T (°K)	k	Δ	T (°R)
				400	15.13	31	720	750	24.77	25	1350
				410	15.45	32	738	760	25.01	24	1368
				420	15.76	31	756	770	25.25	24	1386
80	3.356		144	430	16.08	32	774	780	25.49	24	1404
90	3.755	399	162	440	16.38	30	792	790	25.73	24	1422
100	4.158	403	180	450	16.68	30	810	800	25.96	23	1440
110	4.562	404	198	460	16.99	31	828	810	26.19	23	1458
120	4.967	405	216	470	17.29	30	846	820	26.42	23	1476
130	5.371	404	234	480	17.58	29	864	830	26.66	24	1494
140	5.772	401	252	490	17.88	30	882	840	26.89	23	1512
150	6.173	401	270	500	18.17	29	900	850	27.11	22	1530
160	6.569	396	288	510	18.46	29	918	860	27.33	22	1548
170	6.966	397	306	520	18.75	29	936	870	27.56	23	1566
180	7.359	393	324	530	19.03	28	954	880	27.78	22	1584
190	7.748	389	342	540	19.31	28	972	890	28.00	22	1602
200	8.134	386	360	550	19.59	28	990	900	28.22	22	1620
210	8.516	382	378	560	19.87	28	1008	910	28.44	22	1638
220	8.896	380	396	570	20.15	28	1026	920	28.66	22	1656
230	9.273	377	414	580	20.42	27	1044	930	28.88	22	1674
240	9.644	371	432	590	20.69	27	1062	940	29.10	22	1692
250	10.013	369	450	600	20.96	27	1080	950	29.32	22	1710
260	10.378	365	468	610	21.23	27	1098	960	29.52	20	1728
270	10.739	361	486	620	21.49	26	1116	970	29.74	22	1746
280	11.09	35	504	630	21.81	32	1134	980	29.95	21	1764
290	11.45	36	522	640	22.01	20	1152	990	30.16	21	1782
300	11.80	35	540	650	22.27	26	1170	1000	30.37	21	1800
310	12.15	35	558	660	22.53	26	1188				
320	12.49	34	576	670	22.79	26	1206				
330	12.83	34	594	680	23.04	25	1224				
340	13.17	34	612	690	23.29	25	1242				
350	13.50	33	630	700	23.54	25	1260				
360	13.84	34	648	710	23.79	25	1278				
370	14.17	33	666	720	24.03	24	1296				
380	14.49	32	684	730	24.28	25	1314				
390	14.82	33	702	740	24.52	24	1332				

Conversion Factors for Coefficient of Thermal Conductivity (k)			
To Convert Tabulated Value of	To	Having Dimensions Indicated below	Multiply by
k	k	$lb_F\ hr^{-1}\ °R^{-1}$	1.00000
with dimensions of $ft\ lb_F\ ft^{-1}\ hr^{-1}\ °R^{-1}$		$Btu\ ft^{-1}\ hr^{-1}\ °R^{-1}$	1.28593×10^{-3}
		$cal\ cm^{-1}\ sec^{-1}\ °K^{-1}$	5.31575×10^{-6}
		$joule\ cm^{-1}\ sec^{-1}\ °K^{-1}$	2.2241×10^{-5}
		$erg\ cm^{-1}\ sec^{-1}\ °K^{-1}$	222.411

Table 1510.11a COEFFICIENT OF THERMAL CONDUCTIVITY (k in $ft\text{-}lb_F/ft\text{-}hr\text{-}°R$) for dry air

T (°K)	k at Pressure, Atmosphere 0.01	0.1	0.4	0.7	1.0	T (°R)
100	4.30	4.30			4.32	180
150	6.35	6.35			6.36	270
200	8.19	8.19			8.19	360
273.16	10.56	10.56			10.57	491.69
300	11.35	11.35			11.35	540
400	14.13	14.13			14.13	720
500		16.73	16.73	16.73	16.73	900
600		19.24	19.24	19.24	19.24	1080
800		24.10	24.10	24.10	24.10	1440
1000		28.73	28.73	28.73	28.73	1800
1200		32.92	32.92	32.92	32.92	2160
1400		37.12	37.12	37.12	37.12	2520
1600		41.50	41.46	41.44	41.44	2880
2000		52.34	51.34	51.09	50.96	3600
3000		189.0	143.1	128.3	120.1	5400
5000			679.1	602.1	550.8	9000

T (°K)	k at Pressure, Atmospheres 4.0	7.0	10.0	40.0	70.0	100.0	T (°R)
100							180
150			6.42				270
200			8.23			9.6	360
273.16			10.59				491.69
300			11.37			11.63	540
400			14.14			14.24	720
500	16.73	16.73	16.73	16.74			900
600	19.24	19.24	19.24	19.26			1080
800	24.1	24.1	24.1	24.1	24.12		1440
1000	28.73	28.73	28.73	28.73	28.73		1800
1200	32.92	32.92	32.92	32.94	32.94	32.93	2160
1400	37.12	37.12	37.12	37.13	37.13	37.13	2520
1600	41.44	41.44	41.44	41.42	41.41	41.42	2880
2000	50.64	50.57	50.55	50.47	50.45	50.43	3600
3000	96.79	90.71	87.59	79.37	77.19	76.04	5400
5000	375.3	323.7	297.1	228.7	210.3	199.6	9000

Table 1510.11b COEFFICIENT OF THERMAL CONDUCTIVITY (k in ft-lb$_F$/ft-hr-°R) for dry air (Concluded)

1510.12 Prandtl Number (dry air)

T (°K)	N_{Pr}	$(N_{Pr})^{\frac{2}{3}}$	$(N_{Pr})^{\frac{1}{3}}$	$(N_{Pr})^{\frac{1}{2}}$	T (°R)	T (°K)	N_{Pr}	$(N_{Pr})^{\frac{2}{3}}$	$(N_{Pr})^{\frac{1}{3}}$	$(N_{Pr})^{\frac{1}{2}}$	T (°R)
100	.770	.841	.916	.877	180	550	.680	.774	.879	.825	990
110	.769	.840	.916	.877	198	560	.680	.774	.879	.825	1008
120	.766	.837	.915	.875	216	570	.680	.774	.879	.825	1026
130	.764	.836	.914	.874	234	580	.680	.774	.879	.825	1044
140	.761	.834	.913	.872	252	590	.680	.774	.879	.825	1062
150	.757	.831	.911	.870	270	600	.680	.774	.879	.825	1080
160	.754	.828	.910	.868	288	610	.681	.774	.880	.825	1098
170	.750	.826	.908	.866	306	620	.681	.774	.880	.825	1116
180	.746	.822	.907	.864	324	630	.681	.774	.880	.825	1134
190	.743	.820	.906	.862	342	640	.682	.775	.880	.826	1152
200	.739	.817	.904	.860	360	650	.682	.775	.880	.826	1170
210	.736	.815	.903	.858	378	660	.682	.775	.880	.826	1188
220	.732	.812	.901	.856	396	670	.682	.775	.880	.826	1206
230	.729	.810	.900	.854	414	680	.683	.775	.881	.826	1224
240	.725	.807	.898	.851	432	690	.684	.776	.881	.827	1242
250	.722	.805	.897	.850	450	700	.684	.776	.881	.827	1260
260	.719	.802	.896	.848	468	710	.684	.776	.881	.827	1278
270	.716	.800	.895	.846	486	720	.685	.777	.882	.828	1296
280	.713	.798	.893	.844	504	730	.686	.778	.882	.828	1314
290	.710	.796	.892	.843	522	740	.686	.778	.882	.828	1332
300	.708	.795	.891	.841	540	750	.687	.779	.882	.829	1350
310	.706	.793	.890	.840	558	760	.687	.779	.882	.829	1368
320	.703	.791	.889	.838	576	770	.688	.779	.883	.830	1386
330	.701	.789	.888	.837	594	780	.688	.779	.883	.830	1404
340	.699	.788	.887	.836	612	790	.689	.780	.883	.830	1422
350	.697	.786	.887	.835	630	800	.689	.780	.883	.830	1440
360	.695	.784	.886	.834	648	810	.690	.781	.884	.831	1458
370	.693	.783	.885	.832	666	820	.690	.781	.884	.831	1476
380	.691	.782	.884	.831	684	830	.691	.782	.884	.831	1494
390	.690	.781	.884	.831	702	840	.692	.783	.884	.832	1512
400	.689	.780	.883	.830	720	850	.693	.783	.885	.832	1530
410	.688	.779	.883	.830	738	860	.693	.783	.885	.832	1548
420	.686	.778	.882	.828	756	870	.694	.784	.885	.833	1566
430	.685	.777	.882	.828	774	880	.695	.784	.886	.834	1584
440	.684	.776	.881	.827	792	890	.695	.784	.886	.834	1602
450	.684	.776	.881	.827	810	900	.696	.785	.886	.834	1620
460	.683	.775	.881	.826	828	910	.696	.785	.886	.834	1638
470	.682	.775	.880	.826	846	920	.697	.786	.887	.835	1656
480	.681	.774	.880	.825	864	930	.697	.786	.887	.835	1674
490	.681	.774	.880	.825	882	940	.698	.787	.887	.835	1692
500	.680	.774	.879	.825	900	950	.699	.788	.887	.836	1710
510	.680	.774	.879	.825	918	960	.700	.788	.888	.837	1728
520	.680	.774	.879	.825	936	970	.700	.788	.888	.837	1746
530	.680	.774	.879	.825	954	980	.701	.789	.888	.837	1764
540	.680	.774	.879	.825	972	990	.701	.789	.888	.837	1782
						1000	.702	.790	.889	.838	1800

Table 1510.12 PRANDTL NUMBER (N_{Pr}) for dry air

1510.13 Dew Point (dry air)

T (°K)	p (atm)	$\rho \times 10^5$ $\left(\frac{\text{slugs}}{\text{ft}^3}\right)$	$H_T - U_o^o$ $\times 10^{-6}$ $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	S_T $\left(\frac{\text{ft}^3}{\text{slug}}\right)$	T (°R)
70	.18	1.7772	.74683	35248	126
80	.77	6.778	.84168	33499	144
90	2.31	18.722	.92139	32216	162
100	5.44	42.01	.97904	31210	180
110	11.6	90.42	.99012	30167	198
120	19.4	154.49	.98462	29474	216
130	31.9	292.0	.87073	28413	234

Table 1510.13 DEW POINT for dry air

1510.14 Isentropic Changes

Constant Entropy. $S_T - S_o = 0$						
T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\frac{\text{ft}}{\text{sec}}$	T (°R)
273.2	1.0000	1.000	2.0587	1091.2	0	491.7
300	1.4003	1.275	2.2654	1142.4	271.39	540
400	3.8403	2.618	3.0408	1316.3	1155.8	720
500	8.4483	4.599	3.8274	1469.3	1940.5	900
600	16.368	7.369	4.6320	1610.2	2666.7	1080
700	28.819	11.04	5.4606	1741.8	3343.6	1260
800	47.554	15.85	6.3113	1865.1	3997.4	1440
900	74.506	21.98	7.1859	1980.8	4627.9	1620

Constant Entropy. $S_T - S_o = 5.0040 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}^\circ\text{R}}$ (or, $0.2 \frac{\text{cal}}{\text{gm}^\circ\text{K}}$)						
T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	.054257	.05422	2.0610	762.5		491.7
300	.076220	.06936	2.2681	1141.7	-2516.5	540
400	.20896	.1426	3.0456	1313.6	-1651.3	720
500	.46277	.2526	3.8360	1465.5	- 739.47	900
600	.89596	.4074	4.6468	1597.4	- 106.35	1080
615.1	1.000	.4355	4.7711	1616.5	0	1107.2
700	1.5635	.6170	5.4618	1718.8	562.0	1260
800	2.6212	.8935	6.3411	1831.0	1239.2	1440
900	4.1408	1.253	7.2256	1936.0	1876.0	1620
1000	6.2654	1.704	8.1340	2035.4	2466.2	1800
1100	9.1873	2.269	9.0635	2130.9	3063.0	1980
1200	13.081	2.959	10.012	2222.1	3661.1	2160
1300	18.197	3.797	10.980	2310.0	4260.4	2340
1400	24.802	4.803	11.966	2397.3	4775.5	2520
1500	33.381	5.997	12.970	2481.0	5321.2	2700
1600	44.222	7.405	13.992	2563.3	5853.0	2880
1700	57.830	9.070	15.032	2645.0	6361.2	3060
1800	74.545	11.00	16.090	2725.4	6859.6	3240
1900	95.002	13.24	17.167	2804.5	7411.4	3420
2000	119.64	15.80	18.263	2884.2	7915.0	3600
2100	149.55	18.77	19.379	2963.9	8418.6	3780
2200	184.99	22.12	20.512	3043.3	8911.7	3960

Table 1510.14 ISENTROPIC CHANGES for dry air

Constant Entropy. $S_T - S_o = 10.0080 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $0.4 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	v_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	.025093	.01370	3.8366	1465.3		900
600	.048617	.02212	4.6477	1596.8	-4336.6	1080
700	.085800	.03346	5.4827	1717.8	-3071.3	1260
800	.14219	.04852	6.3429	1829.4	-3011.8	1440
900	.22394	.06792	7.2278	1933.4	-2370.9	1620
1000	.33952	.09267	8.1362	2031.8	-1763.1	1800
1100	.49737	.1234	9.0671	2125.6	-1167.6	1980
1200	.71012	.1615	10.017	2214.2	- 584.3	2160
1300	.98849	.2075	10.987	2299.5	- 17.7	2340
1303.2	1.000	.2091	11.018	2302.2	.0	2345.8
1400	1.3471	.2625	11.974	2381.2	532.2	2520
1500	1.8057	.3289	12.961	2459.3	1077.4	2700
1600	2.3902	.4074	14.005	2535.1	1611.9	2880
1700	3.1206	.5005	15.045	2609.3	2141.7	3060
1800	4.0215	.6091	16.111	2676.8	2660.8	3240
1900	5.1255	.7354	17.194	2746.7	3171.6	3420
2000	6.4930	.8809	18.300	2813.0	3666.0	3600
2100	8.1318	1.055	19.427	2877.3	4165.4	3780
2200	10.165	1.257	20.577	2940.0	4695.5	3960
2300	12.575	1.488	21.754	3000.0	5192.9	4140
2400	15.478	1.751	22.958	3059.4	5689.3	4320
2500	19.050	2.067	24.191	3117.4	6202.1	4500
2600	23.246	2.423	25.454	3174.5	6703.4	4680
2700	28.300	2.838	26.750	3231.3	7208.3	4860
2800	34.283	3.312	28.079	3287	7711.9	5040
2900	41.419	3.859	29.440	3343	8219.1	5220
3000	50.146	4.511	30.834	3399	8745.7	5400
3100	60.159	5.222	32.264	3456	9247.7	5580
3200	72.350	6.046	33.725	3517	9758.5	5760
3300	86.717	6.988	35.216	3573	10272	5940
3400	103.97	8.090	36.746	3635	10800	6120
3500	124.09	9.336	38.304	3697	11335	6300
3600	147.75	10.76	39.886	3763	11853	6480
3700	175.00	12.35	41.498	3829	12379	6660
3800	206.86	14.16	43.115	3898	12907	6840
3900	242.94	16.14	44.745	3967	13420	7020
4000	284.04	18.33	46.374	4042	13928	7200
4100	331.29	20.78	48.004	4114	14441	7380
4200	384.92	23.48	49.666	4196	14949	7560

Table 1510.14 ISENTROPIC CHANGES for dry air (Continued)

Constant Entropy. $S_T - S_o = 15.0120 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $0.6 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
1200	.038358	.008726	10.017	2213.6		2160
1300	.053432	.01122	10.987	2298.6	-6146.6	2340
1400	.072877	.01421	11.974	2380.2	-5593.5	2520
1500	.097975	.01783	12.982	2458.0	-5044.3	2700
1600	.12924	.02205	14.007	2533.5	-4514.1	2880
1700	.16877	.02710	15.053	2612.2	-3964.2	3060
1800	.21782	.03303	16.121	2674.5	-3461.0	3240
1900	.27895	.04007	17.215	2741.1	-2938.0	3420
2000	.35393	.04829	18.339	2803.5	-2420.3	3600
2100	.44514	.05783	19.500	2864.2	-1909.4	3780
2200	.56042	.06947	20.700	2922.2	-1378.6	3960
2300	.70088	.08306	21.954	2977.4	- 851.7	4140
2400	.87652	.09947	23.264	3030.2	- 310.4	4320
2455.7	1.000	.1102	24.033	3059.0	0	4420.3
2500	1.0981	.1195	24.645	3082.0	250.3	4500
2600	1.3713	.1433	26.095	3134.2	815.6	4680
2700	1.7223	.1730	27.624	3186.0	1410.8	4860
2800	2.1586	.2086	29.230	3238.2	2010.5	5040
2900	2.7094	.2522	30.917	3291	2630.2	5220
3000	3.3976	.3049	32.671	3346	3260.5	5400
3100	4.2578	.3687	34.488	3402	3901.2	5580
3200	5.3231	.4451	36.363	3458	4546.9	5760
3300	6.6510	.5373	38.292	3514	5203.4	5940
3400	8.2922	.6476	40.272	3573	5865.1	6120
3500	10.318	.7792	42.289	3632	6551.8	6300
3600	12.776	.9331	44.344	3694	7192.2	6480
3700	15.751	1.114	46.414	3753	7851.4	6660
3800	19.236	1.319	48.499	3816	8490.8	6840
3900	23.477	1.562	50.580	3875	9140.7	7020
4000	28.487	1.840	52.663	3937	9781.8	7200
4100	34.351	2.155	54.800	3999	10408	7380
4200	41.389	2.523	56.917	4062	11043	7560
4300	49.539	2.935	59.024	4124	11662	7740
4400	59.002	3.398	61.141	4186	12271	7920
4500	69.814	3.909	63.253	4249	12861	8100
4600	82.326	4.482	65.343	4314	13447	8280
4700	96.614	5.114	67.423	4377	14020	8460
4800	113.34	5.835	69.477	4442	14602	8640
4900	132.01	6.616	71.558	4511	15164	8820
5000	153.42	7.489	73.665	4580	15728	9000

Table 1510.14 ISENTROPIC CHANGES for dry air (Continued)

Constant Entropy. $S_T - S_o = 20.0160 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $0.8 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T ($^\circ$K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T ($^\circ$R)
2500	.075375	.008130	26.288	3030.1		4500
2600	.10143	.01048	28.290	3091.5	-6577.4	4680
2700	.13689	.01356	30.454	3149.9	-5773.8	4860
2800	.18520	.01760	32.733	3210.0	-4944.2	5040
2900	.25129	.02292	35.111	3273.0	-4089.2	5220
3000	.34855	.03052	37.497	3337	-3142.4	5400
3100	.45810	.03848	40.104	3400	-2360.9	5580
3200	.61117	.04947	42.675	3474	-1457.4	5760
3300	.80774	.06308	45.284	3543	- 645.0	5940
3375.6	1.000	.07559	47.256	3596	0	6076.1
3400	1.0619	.08004	47.891	3612	207.0	6120
3500	1.3802	.1004	50.485	3681	1034.4	6300
3600	1.7781	.1248	53.079	3750	1941.2	6480
3700	2.2760	.1541	55.660	3816	2635.8	6660
3800	2.8897	.1887	58.236	3885	3419.6	6840
3900	3.6215	.2293	60.817	3953	4182.7	7020
4000	4.5126	.2777	63.379	4019	4946.5	7200
4100	5.5703	.3331	65.928	4088	5683.4	7380
4200	6.8344	.3970	68.464	4150	6406.2	7560
4300	8.3330	.4701	70.968	4216	7113.2	7740
4400	10.098	.5531	73.467	4278	7803.5	7920
4500	12.180	.6476	75.958	4341	8483.2	8100
4600	14.645	.7558	78.444	4403	9159.1	8280
4700	17.522	.8778	80.948	4465	9822.8	8460
4800	20.913	1.018	83.456	4528	10483	8640
4900	24.733	1.177	85.987	4583	11143	8820
5000	29.160	1.356	88.536	4646	11802	9000

Table 1510.14 ISENTROPIC CHANGES for dry air (Continued)

Constant Entropy. $S_T - S_o = 25.0200 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $1.0 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)						
T ($^\circ$K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T ($^\circ$R)
3200	.10781	.008288	52.404	3543		5760
3300	.14624	.01086	55.426	3619	-6436.7	5940
3400	.19603	.01405	58.452	3694	-5494.7	6120
3500	.26016	.01798	61.447	3773	-4575.4	6300
3600	.34197	.02277	64.402	3845	-3674.2	6480
3700	.44496	.02853	67.311	3917	-2799.5	6660
3800	.57045	.03522	70.189	3986	-1966.2	6840
3900	.72455	.04328	73.008	4055	-1137.8	7020
4000	.90779	.05276	75.850	4121	- 328.7	7200
4040.9	1.000	.05714	77.016	4147	0	7273.6
4100	1.1331	.06400	78.705	4183	473.4	7380
4200	1.4092	.07726	81.619	4249	1267.4	7560
4300	1.7507	.09312	84.560	4314	2066.6	7740
4400	2.1694	.1119	87.537	4377	2864.2	7920
4500	2.6799	.1340	90.540	4442	3659.1	8100
4600	3.2953	.1597	93.576	4505	4443.6	8280
4700	4.0392	.1897	96.616	4567	5225.1	8460
4800	4.9024	.2246	99.683	4633	6002.6	8640
4900	5.9101	.2646	102.79	4692	6767.7	8820
5000	7.1240	.3114	105.89	4754	7535.4	9000

Table 1510.14 ISENTROPIC CHANGES for dry air (Continued)

Constant Entropy. $S_T - S_o = 30.0240 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^\circ R}$ (or, $1.2 \frac{cal}{gm\,^\circ K}$)

T (°K)	p (atm)	ρ/ρ_o	$U_T \left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	$\sigma \left(\frac{ft}{sec}\right)$	T (°R)
3900	.15975	.009085	85.478	4134		7020
4000	.20722	.01145	88.982	4199	-6021.3	7200
4100	.26740	.01433	92.495	4268	-5074.1	7380
4200	.34403	.01786	96.035	4331	-4126.0	756
4300	.44154	.02219	99.642	4396	-3177.8	7740
4400	.56464	.02745	103.34	4465	-2236.5	7920
4500	.72339	.03400	107.08	4534	-1273.6	8100
4600	.91911	.04184	110.91	4603	- 325.1	8280
4634.3	1.000	.04491	112.23	4629	0	8341.7
4700	1.1547	.05133	114.76	4675	623.4	8460
4800	1.4460	.06267	118.64	4747	1564.0	8640
4900	1.8043	.07615	122.55	4820	2495.7	8820
5000	2.2459	.09222	126.42	4888	3425.2	9000

Constant Entropy. $S_T - S_o = 35.0280 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^\circ R}$ (or, $1.4 \frac{cal}{gm\,^\circ K}$)

T (°K)	p (atm)	ρ/ρ_o	$U_T \left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	$\sigma \left(\frac{ft}{sec}\right)$	T (°R)
4400	.18851	.008615	122.13	4583		7920
4500	.24787	.01104	126.64	4652	-6998.7	8100
4600	.32146	.01392	131.29	4728	-5911.4	8280
4700	.41600	.01749	135.88	4803	-4822.5	8460
4800	.53589	.02184	140.50	4882	-3746.7	8640
4900	.68811	.02714	145.11	4964	-2676.8	8820
5000	.87935	.03351	149.70	5046	-1621.7	9000
5156.5	1.0000	.03720	156.90	5174	0	9281.7

Constant Entropy. $S_T - S_o = 40.0320 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^\circ R}$ (or, $1.6 \frac{cal}{gm\,^\circ K}$)

T (°K)	p (atm)	ρ/ρ_o	$U_T \left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	$\sigma \left(\frac{ft}{sec}\right)$	T (°R)
4800	.24046	.009114	164.90	5039		8640
4900	.30826	.01142	169.96	5125		8820
5000	.39226	.01417	175.02	5213		9000

Table 1510.14 ISENTROPIC CHANGES for dry air (Concluded)

Constant Entropy. $S_T - S_o = 0$						
T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	1.0000	1.0000	1.6199	1092.2	0	491.7
300	1.3867	1.2628	1.8273	1143.7	260.90	540
400	3.8155	2.6013	2.6053	1317.3	1150.1	720
500	8.4076	4.577	3.3943	1471.1	1937.7	900
600	16.287	7.334	4.2020	1611.2	2664.4	1080
700	28.867	11.06	5.0328	1742.8	3352.7	1260
800	47.692	15.90	5.8867	1869.1	4009.5	1440
900	74.859	22.09	6.7644	1992.4	4643.7	1620

Constant Entropy. $S_T - S_o = 5.0040 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}^\circ\text{R}}$ (or, $0.2 \frac{\text{cal}}{\text{gm}^\circ\text{K}}$)						
T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	.054521	.05448	1.6221	1092.2		491.7
300	.075727	.06891	1.8299	1143.4	-2517.2	540
400	.20834	.1422	2.6097	1314.6	-1627.1	720
500	.46055	.2514	3.4026	1464.6	- 835.46	900
600	.88162	.4009	4.2158	1599.1	- 120.47	1080
616.93	1.0000	.4327	4.3576	1620.4	0	1110.5
700	1.5809	.6160	5.0535	1720.8	592.8	1260
800	2.6208	.8934	5.9155	1832.7	1253.3	1440
900	4.1468	1.255	6.8040	1937.3	1893.7	1620
1000	6.2725	1.706	7.7156	2037.4	2504.6	1800
1100	9.1993	2.272	8.6483	2132.5	3101.7	1980
1200	13.120	2.968	9.6008	2224.4	3683.7	2160
1300	18.317	3.822	10.572	2313.0	4256.9	2340
1400	24.960	4.834	11.562	2398.3	4810.7	2520
1500	33.578	6.032	12.581	2484.6	5351.4	2700
1600	44.475	7.447	13.613	2567.9	5883.5	2880
1700	58.140	9.120	14.661	2650.9	6412.1	3060
1800	75.008	11.07	15.732	2731.3	6933.1	3240
1900	95.927	13.37	16.824	2811.7	7456.3	3420
2000	121.22	16.01	17.941	2890.7	7970.5	3600
2100	151.06	18.96	19.083	2968.8	8466.8	3780
2200	187.56	22.43	20.254	3046.6	8971.8	3960

Table 1510.14 ISENTROPIC CHANGES for air with 0.5 mole % moisture content

Constant Entropy. $S_T - S_o = 10.0080 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^\circ R}$ (or, $0.4 \frac{cal}{gm\,^\circ K}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T (°R)
500	.025128	.01372	3.4031	1464.6		900
600	.047715	.02171	4.2165	1597.8	-4393.4	1080
700	.086030	.03355	5.0544	1719.8	-3671.6	1260
800	.14290	.04876	5.9177	1830.4	-3007.9	1440
900	.22503	.06825	6.8059	1934.7	-2374.7	162
1000	.34170	.09327	7.7178	2033.5	-1754.9	1800
1100	.50139	.1244	8.6519	2127.3	-1155.8	1980
1200	.71317	.1622	9.6048	2215.5	- 579.1	2160
1300	.99656	.2092	10.578	2301.2	- 4.9	2340
1300.9	1.000	.2097	10.587	2301.8	0	2341.6
1400	1.3604	.2651	11.570	2382.5	549.2	2520
1500	1.8317	.3331	12.580	2461.3	1102.7	2700
1600	2.4172	.4120	13.612	2536.7	1633.9	2880
1700	3.1660	.5078	14.661	2609.2	2171.9	3060
1800	4.0736	.6170	15.731	2679.3	2687.0	3240
1900	5.2086	.7473	16.822	2747.4	3206.7	3420
2000	6.5877	.8978	17.938	2813.0	3716.9	3600
2100	8.2722	1.073	19.078	2877.9	4225.1	3780
2200	10.343	1.279	20.244	2938.6	4735.2	3960
2300	12.882	1.522	21.438	2999.7	5251.3	4140
2400	15.835	1.791	22.662	3057.7	5743.8	4320
2500	19.056	2.067	23.922	3115.5	6186.0	4500
2600	23.985	2.499	25.209	3173.9	6783.1	4680
2700	29.233	2.930	26.533	3230.3	7293.3	4860
2800	35.591	3.436	27.889	3287	7812.6	5040
2900	43.145	4.017	29.282	3346	8330.4	5220
3000	52.158	4.688	30.707	3399	8851.7	5400
3100	62.893	5.446	32.164	3461	9365.5	5580
3200	75.999	6.336	33.641	3520	9893.7	5760
3300	91.269	7.338	35.150	3583	10415	5940
3400	109.38	8.492	36.684	3648	10943	6120
3500	130.39	9.789	38.241	3714	11467	6300
3600	154.51	11.23	39.823	3776	11980	6480
3700	185.60	13.07	41.549	3835	12558	6660
3800	219.46	14.99	43.183	3911	13088	6840
3900	257.94	17.10	44.825	3980	13609	7020
4000	302.04	19.45	46.468	4055	14126	7200
4100	352.94	22.09	48.107	4134	14647	7380

Table 1510.14 ISENTROPIC CHANGES for air with 0.5 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 15.0120 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $0.6 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
1200	.038920	.002854	9.6053	2215.5		2160
1300	.054479	.01144	10.579	2299.9	-6107.6	2340
1400	.074313	.01449	11.572	2381.6	-5553.8	2520
1500	.099568	.01812	12.583	2459.0	-5012.5	2700
1600	.13176	.02248	13.613	2534.1	-4474.1	2880
1700	.17176	.02758	14.668	2606.6	-3948.5	3060
1800	.22243	.03373	15.747	2675.5	-3417.3	3240
1900	.28573	.04104	16.854	2740.3	-2885.5	3420
2000	.36380	.04963	17.995	2802.2	-2359.2	3600
2100	.45833	.05953	19.175	2863.2	-1843.8	3780
2200	.57707	.07151	20.404	2920.6	-1313.3	3960
2300	.72640	.08605	21.688	2974.4	- 767.7	4140
2400	.91427	.1037	23.034	3028.5	- 207.3	4320
2435.9	1.0000	.1110	23.543	3046.9	0	4384.6
2500	1.1530	.1254	24.450	3079.4	372.7	4500
2600	1.4357	.1499	25.944	3133.5	927.5	4660
2700	1.8189	.1825	27.513	3186.7	1547.9	4860
2800	2.2823	.2203	29.159	3238.2	2152.9	5040
2900	2.8924	.2689	30.874	3294	2804.8	5220
3000	3.6346	.3257	32.666	3350	3440.9	5400
3100	4.5544	.3938	34.513	3406	4082.3	5580
3200	5.7221	.4777	36.407	3461	4745.4	5760
3300	7.1513	.5767	38.359	3520	5402.9	5940
3400	8.9036	.6940	40.362	3579	6059.7	6120
3500	11.099	.8364	42.391	3642	6733.9	6300
3600	13.749	1.002	44.450	3701	7395.7	6480
3700	16.939	1.196	46.522	3763	8056.4	6660
3800	20.715	1.418	48.607	3822	8703.4	6840
3900	25.207	1.674	50.706	3885	9342.2	7020
4000	30.696	1.979	52.800	3944	9997.4	7200
4100	37.053	2.320	54.912	4006	10631	7380
4200	44.455	2.704	57.052	4072	11248	7560
4300	53.206	3.145	59.164	4134	11869	7740
4400	63.290	3.636	61.285	4196	12472	7920
4500	75.246	4.202	63.366	4262	13085	8100
4600	88.476	4.803	65.469	4327	13658	8280
4700	103.85	5.480	67.545	4390	14234	8460
4800	121.44	6.234	69.617	4455	14803	8640
4900	140.07	6.999	71.769	4521	15323	8820
5000	164.07	7.987	73.814	4583	15924	9000

Table 1510.14 ISENTROPIC CHANGES for air with 0.5 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 20.0160 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^\circ R}$ (or, $0.8 \frac{cal}{gm\,^\circ K}$)						
T ($^\circ K$)	p (atm)	ρ/ρ_o	U_T $\left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T ($^\circ R$)
2500	.080867	.008712	26.223	3036.7		4500
2600	.10941	.01129	28.277	3092.8	-6346.8	4680
2700	.14911	.01475	30.461	3152.9	-5512.1	4860
2800	.20173	.01914	32.774	3214.6	-4682.1	5040
2900	.27289	.02484	35.188	3276.9	-3835.9	5220
3000	.37031	.03234	37.666	3346	-2961.9	5400
3100	.49751	.04171	40.213	3412	-2102.7	5580
3200	.66319	.05361	42.791	3481	-1237.2	5760
3300	.87807	.06847	45.392	3550	- 377.3	5940
3400	1.1531	.08675	48.013	3619	470.8	6120
3344.3	1.0000	.07615	46.554	3579	0	6019.7
3500	1.5018	.1090	50.607	3688	1305.8	6300
3600	1.9328	.1353	53.210	3757	2108.6	6480
3700	2.4784	.1673	55.786	3825	2913.7	6660
3800	3.1353	.2042	58.389	3894	3684.0	6840
3900	3.9277	.2465	60.974	3963	4455.7	7020
4000	4.8887	.3005	63.550	4029	5214.6	7200
4100	6.0463	.3610	66.090	4098	5960.0	7380
4200	7.4339	.4310	68.617	4160	6690.9	7560
4300	9.0390	.5087	71.143	4226	7386.1	7740
4400	10.957	.5985	73.643	4288	8078.1	7920
4500	13.220	.7007	76.124	4354	8759.5	8100
4600	15.876	.8165	78.619	4416	9430.1	8280
4700	19.060	.9513	81.096	4475	10110	8460
4800	22.604	1.100	83.632	4537	10762	8640
4900	27.425	1.306	85.879	4596	11549	8820
5000	31.472	1.462	88.703	4659	12070	9000

Table 1510.14 ISENTROPIC CHANGES for air with 0.5 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 25.0200 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $1.0 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)						
T ($^\circ$K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T ($^\circ$R)
3200	.11822	.009085	52.526	3550		5760
3300	.16056	.01191	55.583	3625	-6135.8	5940
3400	.21568	.01543	58.623	3704	-5186.3	6120
3500	.28722	.01980	61.627	3780	-4252.9	6300
3600	.37792	.02508	64.595	3858	-3349.4	6480
3700	.49120	.03137	67.527	3927	-2478.7	6660
3800	.63124	.03880	70.405	3999	-1636.5	6840
3900	.79565	.04752	73.251	4065	- 818.9	7020
4000	.99758	.05792	76.097	4131	- 7.9	7200
4001.0	1.0000	.05803	76.102	4131	0	7201.8
4100	1.2443	.07015	78.957	4196	789.7	7380
4200	1.5509	.08482	81.853	4259	1592.5	7560
4300	1.9253	.1021	84.785	4327	2387.1	7740
4400	2.3777	.1222	87.762	4390	3172.9	7920
4500	2.9392	.1464	90.721	4455	3969.8	8100
4600	3.6036	.1739	93.751	4521	4742.8	8280
4700	4.3961	.2059	96.778	4580	5511.8	8460
4800	5.3222	.2438	99.795	4646	6291.3	8640
4900	6.4300	.2877	102.82	4705	7066.3	8820
5000	7.6932	.3358	105.97	4767	7798.2	9000

Table 1510.14 ISENTROPIC CHANGES for air with 0.5 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 30.0240 \times 10^3 \frac{ft\text{-}lb_F}{slug\ ^\circ R}$ (or, $1.2 \frac{cal}{gm\ ^\circ K}$)						
T ($^\circ$K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T ($^\circ$R)
3800	.13764	.008039	82.371	4075		6840
3900	.17808	.01012	85.803	4144	-6576.8	7020
4000	.23060	.01272	89.225	4216	-5621.7	7200
4100	.29614	.01583	92.680	4275	-4692.6	7380
4200	.37837	.01958	96.215	4344	-3776.9	7560
4300	.48507	.02429	99.750	4409	-2833.0	7740
4400	.61928	.02999	103.39	4478	-1896.0	7920
4500	.78989	.03697	107.11	4547	- 951.8	8100
4600	.99601	.04535	110.91	4619	- 15.1	8280
4601.6	1.0000	.04550	110.97	4619	0	8282.9
4700	1.2484	.05546	114.73	4688	921.3	8460
4800	1.5649	.06771	118.53	4760	1864.2	8640
4900	1.9403	.08173	122.48	4829	2767.1	8820
5000	2.4087	.09867	126.31	4898	3683.1	9000

Constant Entropy. $S_T - S_o = 35.0280 \times 10^3 \frac{ft\text{-}lb_F}{slug\ ^\circ R}$ (or, $1.4 \frac{cal}{gm\ ^\circ K}$)						
T ($^\circ$K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T ($^\circ$R)
4400	.20327	.009292	121.91	4593		7920
4500	.26581	.01183	126.44	4662	-6157.1	8100
4600	.34477	.01491	131.01	4738	-5067.9	8280
4700	.44654	.01874	135.54	4813	-3976.4	8460
4800	.57523	.02337	140.12	4892	-2906.5	8640
4900	.73826	.02904	144.67	4974	-1834.6	8820
5000	.93925	.03568	149.32	5056	- 801.5	9000
5080.3	1.0000	.03754	153.05	5121	0	9144.5

Constant Entropy. $S_T - S_o = 40.0320 \times 10^3 \frac{ft\text{-}lb_F}{slug\ ^\circ R}$ (or, $1.6 \frac{cal}{gm\ ^\circ K}$)						
T ($^\circ$K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T ($^\circ$R)
4800	.25486	.009673	164.25	5046		8640
4900	.32731	.01214	169.21	5131		8820
5000	.41558	.01501	174.36	5223		9000

Table 1510.14 ISENTROPIC CHANGES for air with 0.5 mole % moisture content (Concluded)

Constant Entropy. $S_T - S_o = 0$						
T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	1.0000	1.0000	1.1794	1093.2	0	491.7
300	1.3867	1.2628	1.3873	1144.0	261.05	540
400	3.8213	2.6055	2.1680	1317.9	1152.6	720
500	8.4323	4.591	2.9595	1472.4	1943.0	900
600	16.125	7.263	3.7699	1612.5	2650.5	1080
700	29.044	11.13	4.6027	1744.4	3366.5	1260
800	48.076	16.03	5.4602	1870.7	4026.9	1440
900	75.186	22.19	6.3411	1993.8	4654.8	1620

Constant Entropy. $S_T - S_o = 5.0040 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $0.2 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)						
T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	.054784	.054747	1.1817	1093.5		491.7
300	.076217	.069360	1.3902	1144.7	-2523.6	540
400	.21001	.14333	2.1725	1316.3	-1630.4	720
500	.46349	.2530	2.9680	1466.2	- 840.02	900
600	.90010	.4093	3.7837	1600.1	- 102.26	1080
614.4	1.000	.4364	3.9046	1618.8	0	1105.9
700	1.5936	.6210	4.6238	1721.8	590.2	1260
800	2.6422	.9007	5.4894	1834.0	1251.0	1440
900	4.1799	1.265	6.3807	1939.6	1891.7	1620
1000	6.3459	1.726	7.2949	2038.7	2509.8	1800
1100	9.3201	2.302	8.2308	2134.5	3110.9	1980
1200	13.292	3.007	9.1873	2225.7	3693.2	2160
1300	18.492	3.859	10.163	2314.6	4259.5	2340
1400	25.279	4.896	11.155	2400.9	4821.2	2520
1500	33.967	6.101	12.168	2485.9	5358.6	2700
1600	45.286	7.581	13.198	2570.2	5907.5	2880
1700	58.992	9.253	14.247	2652.9	6428.1	3060
1800	76.231	11.25	15.316	2733.3	6955.4	3240
1900	97.131	13.54	16.404	2814.0	7468.2	3420
2000	122.73	16.21	17.514	2892.4	7981.3	3600
2100	153.59	19.28	18.644	2971.1	8490.5	3780
2200	191.47	22.90	19.796	3048.9	9008.8	3960

Table 1510.14 ISENTROPIC CHANGES for air with 1.0 mole % moisture content

Constant Entropy. $S_T - S_o = 10.0080 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $0.4 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	.025440	.01389	2.9682	1466.2		900
600	.049253	.02241	3.7841	1599.4	-4340.2	1080
700	.087561	.03415	4.6243	1720.1	-3641.1	1260
800	.14474	.04939	5.4908	1832.0	-2985.6	1440
900	.22905	.06947	6.3821	1936.0	-2342.8	1620
1000	.34839	.09509	7.2976	2034.8	-1719.5	1800
1100	.50864	.1262	8.2344	2127.9	-1129.9	1980
1200	.72508	.1649	9.1919	2217.2	- 549.5	2160
1295.6	1.0000	.2103	10.126	2299.5	0	2332.1
1300	1.0128	.2126	10.169	2303.1	25.3	2340
1400	1.3892	.2707	11.164	2384.8	590.9	2520
1500	1.8649	.3391	12.180	2462.9	1137.1	2700
1600	2.4564	.4187	13.213	2538.1	1664.4	2880
1700	3.2176	.5161	14.269	2610.6	2203.1	3060
1800	4.1602	.6301	15.344	2682.1	2731.3	3240
1900	5.3190	.7631	16.442	2749.0	3251.3	3420
2000	6.7377	.9182	17.564	2814.6	3766.1	3600
2100	8.4822	1.100	18.713	2878.9	4279.2	3780
2200	10.620	1.313	19.888	2939.6	4794.3	3960
2300	13.138	1.552	21.092	3001.0	5291.3	4140
2400	16.324	1.846	22.328	3058.7	5818.2	4320
2500	20.065	2.176	23.599	3117.4	6325.1	4500
2600	24.651	2.568	24.904	3174.5	6846.8	4680
2700	30.149	3.021	26.243	3231.6	7367.1	4860
2800	36.709	3.543	27.617	3287	7886.5	5040
2900	44.643	4.155	29.029	3346	8415.0	5220
3000	54.244	4.873	30.473	3406	8953.1	5400
3100	65.297	5.645	32.401	3465	9458.3	5580
3200	79.120	6.586	33.449	3527	9997.4	5760
3300	95.270	7.648	34.977	3589	10529	5940
3400	114.17	8.852	36.534	3652	11058	6120
3500	136.17	10.21	38.114	3717	11584	6300
3600	162.16	11.77	39.715	3783	12118	6480
3700	192.66	13.55	41.343	3852	12655	6660
3800	227.96	15.55	42.989	3921	13190	6840
3900	268.09	17.75	44.665	3996	13714	7020
4000	314.90	20.25	46.356	4068	14245	7200
4100	370.92	23.18	48.062	4147	14800	7380

Table 1510.14 ISENTROPIC CHANGES for air with 1.0 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 15.0120 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $0.6 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
1300	.[illegible]	.009053	9.1928	2217.2		2160
1320	.[illegible]	.01167	10.170	2301.5	-6084.6	2340
1400	.[illegible]	.01478	11.165	2383.5	-5507.2	2520
1500	.10237	.01863	12.183	2461.6	-4947.8	2700
1600	.13610	.02305	13.219	2535.8	-4415.0	2880
1700	.17662	.02836	14.278	2607.6	-3882.2	3060
1800	.22650	.03465	15.363	2676.2	-3353.0	3240
1900	.29366	.04218	16.478	2741.5	-2820.2	3420
2000	.37325	.05092	17.629	2803.8	-2298.2	3600
2100	.47184	.06128	18.822	2862.9	-1773.6	3780
2200	.59695	.07397	20.064	2920.6	-1229.0	3960
2300	.75399	.08930	21.364	2975.4	- 673.9	4140
2400	.94618	.1073	22.728	3028.2	- 123.4	4320
2421.6	1.0000	.1118	23.039	3039.7	0	4358.9
2500	1.1948	.1299	24.167	3080.4	461.6	4500
2600	1.5053	.1571	25.684	3132.9	1051.8	4680
2700	1.8976	.1903	27.281	3186.7	1656.8	4860
2800	2.4039	.2319	28.952	3240.5	2293.0	5040
2900	3.0333	.2818	30.702	3294	2929.1	5220
3000	3.8237	.3424	32.521	3350	3576.1	5400
3100	4.8153	.4160	34.396	3406	4233.9	5580
3200	6.0602	.5054	36.318	3448	4901.2	5760
3300	7.5744	.6101	38.302	3524	5557.7	5940
3400	9.4027	.7389	40.320	3586	6238.5	6120
3500	11.856	.8920	42.369	3645	6919.3	6300
3600	14.661	1.067	44.455	3707	7576.1	6480
3700	18.084	1.275	46.536	3766	8243.7	6660
3800	22.119	1.512	48.639	3829	8891.7	6840
3900	26.963	1.788	50.747	3891	9537.7	7020
4000	32.777	2.110	52.859	3950	10187	7200
4100	39.531	2.471	54.989	4016	10816	7380
4200	47.565	2.888	57.124	4078	11447	7560
4300	56.605	3.344	59.267	4144	12050	7740
4400	67.763	3.884	61.371	4206	12675	7920
4500	80.189	4.467	63.474	4268	13268	8100
4600	94.611	5.122	65.568	4334	13856	8280
4700	110.88	5.835	67.653	4403	14425	8460
4800	129.84	6.648	69.716	4468	15004	8640
4900	151.19	7.537	71.796	4537	15569	8820
5000	175.42	8.518	73.922	4610	16129	9000

Table 1510.14 ISENTROPIC CHANGES for air with 1.0 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 20.0160 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^\circ R}$ (or, $0.8 \frac{cal}{gm\,^\circ K}$)						
T ($^\circ$K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T ($^\circ$R)
2500	.085918	.009252	26.023	3038.1		4500
2600	.11656	.01202	28.146	3096.5	-6188.3	4680
2700	.15955	.01577	30.390	3156.5	-5339.9	4860
2800	.21671	.02054	32.740	3218.3	-4496.7	5040
2900	.29448	.02677	35.167	3284.	-3654.8	5220
3000	.39917	.03480	37.651	3350	-2764.8	5400
3100	.53620	.04492	40.210	3415	-1901.9	5580
3200	.71606	.05783	42.807	3563	-1020.3	5760
3300	.94826	.07365	45.432	3556	- 149.3	5940
3317.3	1.000	.07701	45.887	3566	0	5971.1
3400	1.2478	.09372	48.062	3615	704.7	6120
3500	1.6208	.1174	50.679	3697	1528.3	6300
3600	2.0922	.1461	53.282	3760	2344.8	6480
3700	2.6758	.1801	55.894	3832	3139.1	6660
3800	3.3886	.2206	58.497	3898	3922.6	6840
3900	4.2602	.2694	61.069	3970	4707.7	7020
4000	5.2961	.3252	63.672	4035	5461.3	7200
4100	6.5420	.3900	66.230	4108	6201.8	7380
4200	8.0326	.4648	68.775	4170	6928.1	7560
4300	9.7716	.5486	71.297	4236	7624.7	7740
4400	11.851	.6455	73.796	4301	8318.6	7920
4500	14.327	.7570	76.273	4364	9008.8	8100
4600	17.209	.8820	78.768	4426	9680.8	8280
4700	20.553	1.023	81.286	4491	10341	8460
4800	24.343	1.184	83.812	4547	11003	8640
4900	28.760	1.367	86.330	4610	11659	8820
5000	33.934	1.574	88.843	4669	12316	9000

Table 1510.14 ISENTROPIC CHANGES for air with 1.0 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o \doteq 25.0200 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $1.0 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)						
T ($^\circ$K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T ($^\circ$R)
3200	.12681	.009894	52.650	3602		5760
3300	.17552	.01299	55.723	3632	-3306.1	5940
3400	.23640	.01686	58.777	3661	-4345.3	6120
3500	.31520	.02167	61.833	3689	-5312.7	6300
3600	.41363	.02749	64.880	3718	-6201.3	6480
3700	.54047	.03436	67.921	3937	-2123.9	6660
3800	.69259	.04252	70.612	4009	-1205.1	6840
3900	.87105	.05200	73.485	4075	- 471.8	7020
3956.1	1.0000	.05838	75.143	4114	0	7124.6
4000	1.0931	.06356	76.336	4144	341.3	7200
4100	1.3687	.07701	79.173	4209	1154.9	7380
4200	1.7017	.09282	82.097	4272	1946.5	7560
4300	2.1131	.1117	85.101	4341	2743.3	7740
4400	2.6070	.1335	87.964	4403	3524.0	7920
4500	3.2073	.1591	90.946	4466	4302.8	8100
4600	3.9272	.1887	93.930	4534	5070.9	8280
4700	4.7709	.2235	96.936	4600	5842.3	8460
4800	5.7536	.2634	99.957	4659	6602.3	8640
4900	6.9125	.3089	103.02	4715	7349.1	8820
5000	8.3251	.3628	106.04	4777	8112.8	9000

Table 1510.14 ISENTROPIC CHANGES for air with 1.0 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 30.0240 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^oR}$ (or, $1.2 \frac{cal}{gm\,^oK}$)

T (°K)	p (atm)	ρ/ρ_o	$U_T \left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T (°R)
3800	.15330	.008954	82.758	4091		6840
3900	.19822	.01125	86.122	4160	-6130.9	7020
4000	.25531	.01405	89.509	4232	-5198.8	7200
4100	.32705	.01743	92.905	4291	-4279.6	7380
4200	.41748	.02155	96.373	4357	-3368.1	7560
4300	.53285	.02656	99.890	4426	-2442.3	7740
4400	.67819	.03271	103.49	4488	-1516.7	7920
4500	.86092	.04013	107.19	4560	- 592.2	8100
4563.6	1.000	.04568	109.57	4606	0	8214.5
4600	1.0797	.04915	110.93	4633	339.9	8280
4700	1.3521	.06001	114.69	4701	1271.3	8460
4800	1.6896	.07303	118.47	4774	2201.4	8640
4900	2.0969	.08816	122.33	4839	3106.6	8820
5000	2.5961	.1061	126.15	4906	4008.5	9000

Constant Entropy. $S_T - S_o = 35.0280 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^oR}$ (or, $1.4 \frac{cal}{gm\,^oK}$)

T (°K)	p (atm)	ρ/ρ_o	$U_T \left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T (°R)
4400	.21923	.01002	121.73	4600		7920
4500	.28609	.01272	126.23	4672	-5304.8	8100
4600	.37121	.01603	130.72	4747	-4213.2	8280
4700	.47877	.02005	135.25	4823	-3143.0	8460
4800	.61357	.02483	139.90	4902	-2094.5	8640
4900	.78646	.03092	144.38	4984	-1020.7	8820
4998.5	1.000	.03788	148.88	5066	0	8997.3
5000	1.0033	.03799	148.95	5065	14.4	9000

Constant Entropy. $S_T - S_o = 40.0320 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^oR}$ (or, $1.6 \frac{cal}{gm\,^oK}$)

T (°K)	p (atm)	ρ/ρ_o	$U_T \left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T (°R)
4700	.20987	.008156	158.59	4977		8460
4800	.26597	.01009	164.15	5052		8640
4900	.34572	.01282	168.70	5136		8820
5000	.43921	.01585	173.81	5226		9000

Table 1510.14 ISENTROPIC CHANGES for air with 1.0 mole % moisture content (Concluded)

Constant Entropy. $S_T - S_o = 0$

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	1.0000	1.000	-2.4055	1099.4	0	491.7
300	1.3889	1.265	-2.1928	1151.6	264.47	540
400	3.8515	2.627	-1.3906	1326.8	1166.9	720
500	8.5406	4.651	- .57970	1481.3	1972.1	900
600	16.700	7.525	.25162	1622.0	2718.6	1080
700	29.559	11.34	1.1073	1753.6	3411.4	1260
800	49.207	16.43	1.9879	1880.9	4064.3	1440
900	77.547	22.92	2.8939	2003.6	4731.3	1620

Constant Entropy. $S_T - S_o = 5.0040 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug °R}}$ (or, 0.2 $\frac{\text{cal}}{\text{gm °K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	.057225	.05718	-2.4024	1100.4		491.7
300	.079613	.07244	-2.1889	1151.6	-2502.8	540
400	.22115	.1509	-1.3876	1324.5	-1594.2	720
500	.49194	.2685	- .57236	1475.1	- 767.66	900
600	.95641	.435	.26450	1609.6	- 40.49	1080
605.6	1.000	.4470	.31278	1617.1	0	1090.1
700	1.7054	.6645	1.1271	1732.3	664.0	1260
800	2.8362	.9668	2.0162	1845.1	1334.6	1440
900	4.5086	1.364	2.9321	1950.6	1988.5	1620
1000	6.8763	1.870	3.8729	2051.5	2619.7	1800
1100	10.135	2.503	4.8369	2147.0	3231.3	1980
1200	14.499	3.280	5.8209	2238.8	3824.1	2160
1300	20.264	4.229	6.8275	2328.7	4404.8	2340
1400	27.856	5.384	7.8525	2415.3	4977.7	2520
1500	37.627	6.745	8.8991	2500.0	5531.2	2700
1600	50.041	8.368	9.9638	2583.0	6079.4	2880
1700	65.834	10.32	11.049	2665.0	6628.3	3060
1800	84.913	12.53	12.156	2747.0	7155.5	3240
1900	109.38	15.25	13.284	2827.7	7702.7	3420
2000	138.03	18.24	14.435	2907.1	8214.9	3600
2100	173.29	21.77	15.610	2987.9	8736.9	3780

Table 1510.14 ISENTROPIC CHANGES for air with 5.0 mole % moisture content

Constant Entropy. $S_T - S_o = 10.0080 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $0.4 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
400	.012665	.008643	-1.3875	1324.1		720
500	.028173	.01538	- .57146	1475.1	-4914.4	900
600	.054953	.02500	.26567	1609.2	-4164.7	1080
700	.097425	.03799	1.1286	1731.3	-3465.9	1260
800	.16230	.05537	2.0171	1843.5	-2792.6	1440
900	.25808	.07826	2.9340	1948.2	-2136.8	1620
1000	.39318	.1073	3.8753	2046.6	-1506.6	1800
1100	.57962	.1438	4.8405	2141.1	- 893.4	1980
1200	.82848	.1884	5.8268	2230.6	- 302.2	216
1251.5	1.000	.2156	6.3456	2275.3	0	2252.7
1300	1.1618	.2438	6.8338	2316.3	283.1	2340
1400	1.5932	.3104	7.8610	2398.6	852.4	2520
1500	2.1490	.3907	8.9108	2477.4	1413.4	2700
1600	2.8490	.4855	9.9804	2552.5	1959.6	2880
1700	3.7378	.5994	11.073	2625.7	2505.6	3060
1800	4.8713	.7377	12.188	2695.9	3058.1	3240
1900	6.2483	.8963	13.329	2763.1	3589.6	3420
2000	7.9452	1.082	14.498	2829.4	4116.1	3600
2100	10.051	1.302	15.697	2892.4	4645.7	3780
2200	12.664	1.564	16.930	2954.4	5182.1	3960
2300	15.846	1.870	18.195	3015.4	5715.2	4140
2400	19.696	2.225	19.498	3074.1	6244.4	4320
2500	24.358	2.639	20.840	3131.9	6773.9	4500
2600	30.128	3.135	22.223	3190.9	7318.2	4680
2700	37.208	3.724	23.645	3248.7	7872.7	4860
2800	45.535	4.389	25.108	3307	8410.7	5040
2900	55.916	5.189	26.612	3363	8969.1	5220
3000	68.708	6.124	28.155	3425	9531.8	5400
3100	83.740	7.182	29.739	3488	10082	5580
3200	102.23	8.450	31.355	3547	10654	5760
3300	123.82	9.877	33.017	3612	11213	5940
3400	150.12	11.57	34.532	3681	11788	6120
3500	181.07	13.50	36.433	3750	12362	6300
3600	217.20	15.68	38.176	3819	12929	6480
3700	260.73	18.24	39.922	3894	13512	6660
3800	309.21	20.98	41.667	3973	14063	6840
3900	364.66	24.01	43.416	4052	14605	7020

Table 1510.14 ISENTROPIC CHANGES for air with 5.0 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 15.0120 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $0.6 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
1100	.033185	.008235	4.8405	2140.7		1980
1200	.047437	.01079	5.8263	2228.7	-6252.0	2160
1300	.066393	.01394	6.8365	2314.3	-5670.9	2340
1400	.091456	.01783	7.8633	2397.3	-5090.9	2520
1500	.12294	.02237	8.9144	2474.7	-4538.0	2700
1600	.16327	.02785	9.9881	2550.2	-3987.9	2880
1700	.21492	.03450	11.088	2620.7	-3434.4	3060
1800	.27964	.04239	12.217	2689.0	-2887.5	3240
1900	.36161	.05192	13.384	2753.6	-2335.6	3420
2000	.46185	.06298	14.591	2816.3	-1797.9	3600
2100	.58942	.07651	15.847	2875.0	-1243.8	3780
2200	.75078	.09297	17.164	2932.7	- 678.1	3960
2300	.95483	.1130	18.544	2986.9	- 101.7	4140
2317.4	1.000	.1169	18.798	2996.4	0	4171.3
2400	1.2138	.1375	20.000	3040.3	489.8	4320
2500	1.5455	.1678	21.540	3092.8	1102.0	4500
2600	1.9639	.2046	23.171	3147.3	1719.5	4680
2700	2.5116	.2514	24.886	3200.8	2373.4	4860
2800	3.2088	.3089	26.685	3257.2	3038.7	5040
2900	4.1155	.3814	28.564	3314	3731.3	5220
3000	5.2480	.4686	30.520	3369	4419.6	5400
3100	6.6560	.5730	32.552	3428	5103.7	5580
3200	8.5059	.7064	34.623	3491	5827.4	5760
3300	10.780	.8638	36.754	3550	6535.4	5940
3400	13.611	1.053	38.928	3612	7244.4	6120
3500	17.097	1.279	41.092	3671	7953.7	6300
3600	21.300	1.542	43.302	3737	8645.3	6480
3700	26.417	1.852	45.522	3799	9336.6	6660
3800	32.654	2.218	47.752	3862	10027	6840
3900	40.157	2.644	49.994	3927	10710	7020
4000	49.028	3.130	52.251	3993	11379	7200
4100	59.574	3.689	54.489	4058	12040	7380
4200	72.139	4.333	56.727	4124	12699	7560
4300	86.652	5.049	58.948	4196	13335	7740
4400	103.42	5.845	61.163	4265	13954	7920
4500	122.92	6.745	63.334	4337	14571	8100
4600	144.56	7.709	65.514	4409	15154	8280
4700	170.15	8.825	67.640	4482	15756	8460
4800	199.12	10.05	69.779	4557	16345	8640
4900	231.58	11.38	71.959	4639	16915	8820
5000	269.16	12.88	74.152	4724	17495	9000

Table 1510.14 ISENTROPIC CHANGES for air with 5.0 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 20.0160 \times 10^3 \frac{ft\text{-}lb_F}{slug\,^\circ R}$ (or, $0.8 \frac{cal}{gm\,^\circ K}$)						
T ($^\circ K$)	p (atm)	ρ/ρ_o	U_T $\left(\frac{ft\text{-}lb_F}{slug}\right)$	a $\left(\frac{ft}{sec}\right)$	σ $\left(\frac{ft}{sec}\right)$	T ($^\circ R$)
2400	.087146	.009799	21.532	2997.0		4320
2500	.11942	.01284	23.626	3054.1	-5998.7	4500
2600	.16434	.01691	25.893	3112.2	-5150.3	4680
2700	.22746	.02241	28.296	3175.8	-4264.8	4860
2800	.31536	.02975	30.824	3239.2	-3356.3	5040
2900	.43727	.03949	33.458	3304	-2429.5	5220
3000	.60284	.05234	36.163	3373	-1489.2	5400
3100	.82100	.06858	38.933	3445	- 567.6	5580
3161.4	1.000	.08084	40.646	3488	0	5690.5
3200	1.1126	.08944	41.722	3514	356.3	5760
3300	1.4894	.1152	44.538	3586	1253.3	5940
3400	1.9864	.1478	47.986	3658	2156.8	6120
3500	2.6170	.1872	50.098	3730	3030.8	6300
3600	3.3883	.2342	52.895	3799	3873.0	6480
3700	4.3663	.2924	55.651	3875	4725.4	6660
3800	5.5575	.3605	58.425	3944	5543.3	6840
3900	7.0270	.4415	61.172	4016	6350.1	7020
4000	8.8182	.5364	63.888	4088	7139.4	7200
4100	10.945	.6444	66.554	4157	7895.7	7380
4200	13.484	.7680	69.211	4226	8630.9	7560
4300	16.559	.9124	71.778	4295	9364.5	7740
4400	20.062	1.073	74.395	4360	10068	7920
4500	24.214	1.263	76.994	4429	10782	8100
4600	28.952	1.472	79.606	4495	11465	8280
4700	34.545	1.712	82.168	4560	12150	8460
4800	40.900	1.975	84.744	4626	12807	8640
4900	48.227	2.269	87.298	4688	13452	8820
5000	56.696	2.597	89.856	4754	14090	9000

Table 1510.14 ISENTROPIC CHANGES for air with 5.0 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 25.0200 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ R}$ (or, $1.0 \frac{\text{cal}}{\text{gm}\,^\circ K}$)						
T ($^\circ K$)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T ($^\circ R$)
3000	.11252	.009307	45.658	3438		5400
3100	.16041	.01276	49.058	3514	-5992.4	5580
3200	.22594	.01727	52.426	3609	-4914.7	5760
3300	.32090	.02352	55.651	3678	-3789.0	5940
3400	.43238	.03038	59.601	3760	-2837.3	6120
3500	.58532	.03936	62.330	3839	-1852.7	6300
3600	.76990	.05019	65.509	3917	- 910.4	6480
3699.3	1.000	.06318	68.585	3993	0	6658.7
3700	1.0017	.06328	68.608	3993	6.2	6660
3800	1.2884	.07876	71.661	4072	888.8	6840
3900	1.6406	.09694	74.697	4144	1741.5	7020
4000	2.0835	.1189	77.683	4216	2596.1	7200
4100	2.6137	.1440	80.682	4288	3410.4	7380
4200	3.2701	.1739	83.668	4360	4224.7	7560
4300	4.0387	.2079	86.636	4429	5009.8	7740
4400	4.9061	.2466	89.554	4498	5771.3	7920
4500	5.9463	.2915	92.463	4564	6529.5	8100
4600	7.1802	.3429	95.386	4629	7276.6	8280
4700	8.6497	.4021	98.318	4698	8019.7	8460
4800	10.378	.4693	101.30	4764	8750.6	8640
4900	12.418	.5460	104.29	4829	9476.4	8820
5000	14.838	.6342	107.30	4892	10204	9000

Table 1510.14 ISENTROPIC CHANGES for air with 5.0 mole % moisture content (Continued)

Constant Entropy. $S_T - S_o = 30.0240 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $1.2 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
3500	.15108	.009627	75.260	3953		6300
3600	.19886	.01228	78.637	4032	-5910.7	6480
3700	.25884	.01545	81.997	4108	-4974.1	6660
3800	.33552	.01933	85.262	4190	-4045.9	6840
3900	.42874	.02382	88.514	4259	-3162.4	7020
4000	.54638	.02927	91.711	4331	-2277.6	7200
4100	.6936	.03562	94.945	4393	-1421.3	7380
4200	.86108	.04314	98.242	4462	- 573.2	7560
4267.2	1.000	.04904	100.49	4511	0	7681.0
4300	1.0677	.05217	101.59	4534	281.2	7740
4400	1.3240	.06298	105.00	4600	1141.1	7920
4500	1.6438	.07602	108.44	4669	2013.8	8100
4600	2.0332	.09133	111.93	4738	2876.6	8280
4700	2.5002	.1090	115.47	4806	3721.4	8460
4800	3.0755	.1301	118.99	4875	4578.4	8640
4900	3.7563	.1541	122.58	4941	5407.8	8820
5000	4.5808	.1822	126.16	5007	6240.5	9000

Constant Entropy. $S_T - S_o = 35.0280 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $1.4 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
4100	.19206	.009473	109.31	4482		7380
4200	.24797	.01189	113.38	4551	-5741.1	7560
4300	.31956	.01487	117.41	4623	-4715.2	7740
4400	.40889	.01844	121.53	4688	-3711.0	7920
4500	.52387	.02288	125.67	4760	-2692.3	8100
4600	.66635	.02816	129.95	4839	-1695.5	8280
4700	.84702	.03461	134.23	4915	- 690.9	8460
4768.7	1.000	.03981	137.19	4967	0	8583.7
4800	1.0698	.04239	138.54	4990	313.3	8640
4900	1.3314	.05158	142.90	5066	1300.5	8820
5000	1.6494	.06237	147.28	5138	2269.7	9000

Constant Entropy. $S_T - S_o = 40.0320 \times 10^3 \frac{\text{ft-lb}_F}{\text{slug}\,^\circ\text{R}}$ (or, $1.6 \frac{\text{cal}}{\text{gm}\,^\circ\text{K}}$)

T (°K)	p (atm)	ρ/ρ_o	U_T $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	a $\left(\frac{\text{ft}}{\text{sec}}\right)$	σ $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
4500	.20271	.008315	145.54	4888		8100
4600	.26168	.01047	150.53	4964		8280
4700	.33651	.01311	155.47	5039		8460
4800	.43094	.01632	160.43	5118		8640
4900	.54915	.02018	165.42	5203		8820
5000	.69525	.02476	170.45	5282		9000

Table 1510.14 ISENTROPIC CHANGES for air with 5.0 mole % moisture content (Concluded)

1510.15 Shock Front Conditions

$\rho_1/\rho_o = 0.008$ $T_1 = 273.2°K$

T ($°K$)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{ft\text{-}lb_F}{slug}\right)$	u_1 $\left(\frac{ft}{sec}\right)$	T ($°R$)
273.2	1.000	.0080059	2.0612	1090.5	491.7
300	1.259	.011068	2.2683	1252.6	540
400	2.218	.025999	3.0459	1858.9	720
500	2.938	.043049	3.8365	2366.8	900
600	3.466	.060940	4.6477	2801.2	1080
700	3.874	.079467	5.4827	3187.0	1260
800	4.204	.098554	6.3429	3540	1440
900	4.480	.11816	7.2278	3868	1620
1000	4.717	.13823	8.1367	4173	1800
1100	4.925	.15875	9.0676	4465	1980
1200	5.108	.17963	10.017	4744	2160
1300	5.274	.20092	10.987	5010	2340
1400	5.424	.22253	11.974	5266	2520
1500	5.563	.24454	12.981	5512	2700
1600	5.692	.26689	14.007	5755	2880
1700	5.813	.28961	15.051	5988	3060
1800	5.929	.31277	16.120	6217	3240
1900	6.041	.33641	17.212	6440	3420
2000	6.152	.36067	18.338	6663	3600
2100	6.265	.38577	19.506	6883	3780
2200	6.381	.41182	20.725	7106	3960
2300	6.506	.43929	22.019	7333	4140
2400	6.643	.46864	23.405	7562	4320
2500	6.796	.50033	24.917	7802	4500
2600	6.969	.53492	26.578	8054	4680
2700	7.166	.57322	28.426	8320	4860
2800	7.387	.61563	30.488	8609	5040
2900	7.635	.66296	32.801	8914	5220
3000	7.908	.71553	35.382	9242	5400
3100	8.201	.77352	38.239	9587	5580
3200	8.509	.83695	41.374	9951	5760
3300	8.829	.90583	44.778	10335	5940
3400	9.147	.97923	48.418	10722	6120
3500	9.455	1.0558	52.215	11112	6300
3600	9.747	1.1348	56.124	11506	6480
3700	10.015	1.2150	60.105	11893	6660
3800	10.259	1.2952	64.068	12264	6840
3900	10.480	1.3757	68.040	12621	7020
4000	10.681	1.4562	72.031	12979	7200
4100	10.870	1.5377	76.061	13327	7380
4200	11.056	1.6217	80.205	13675	7560
4300	11.239	1.7089	84.515	14032	7740
4400	11.427	1.8002	89.054	14390	7920
4500	11.624	1.8976	93.878	14764	8100
4600	11.832	2.0021	99.061	15151	8280
4700	12.047	2.1134	104.63	15561	8460
4800	12.276	2.2340	110.63	15987	8640
4900	12.515	2.3638	117.11	16430	8820
5000	12.760	2.5031	124.08	16896	9000

Table 1510.15 SHOCK FRONT CONDITIONS for dry air

$\rho_1/\rho_o = 1.0$ $T_1 = 273.2°K$

T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{ft\text{-}lb_F}{slug}\right)$	u_1 $\left(\frac{ft}{sec}\right)$	T (°R)
273.2	1.000	1.0001	2.0587	1091.2	491.7
300	1.259	1.3829	2.2653	1252.6	540
400	2.215	3.2472	3.0412	1858.9	720
500	2.930	5.3813	3.8306	2368.4	900
600	3.454	7.6190	4.6410	2802.8	1080
700	3.859	9.9365	5.4750	3190.0	1260
800	4.185	12.324	6.3348	3543	1440
900	4.458	14.776	7.2197	3871	1620
1000	4.692	17.289	8.1281	4180	1800
1100	4.896	19.854	9.0585	4472	1980
1200	5.077	22.470	10.008	4747	2160
1300	5.240	25.135	10.978	5016	2340
1400	5.387	27.843	11.965	5272	2520
1500	5.523	30.595	12.971	5522	2700
1600	5.649	33.388	13.995	5761	2880
1700	5.768	36.227	15.038	5997	3060
1800	5.879	39.114	16.100	6224	3240
1900	5.986	42.041	17.181	6447	3420
2000	6.088	45.036	18.283	6667	3600
2100	6.187	48.062	19.406	6883	3780
2200	6.282	51.135	20.548	7090	3960
2300	6.376	54.264	21.713	7300	4140
2400	6.467	57.460	22.902	7507	4320
2500	6.558	60.708	24.119	7710	4500
2600	6.648	64.029	25.363	7910	4680
2700	6.738	67.426	26.641	8110	4860
2800	6.828	70.916	27.951	8314	5040
2900	6.920	74.486	29.303	8514	5220
3000	7.014	78.165	30.698	8711	5400
3100	7.109	81.963	32.142	8917	5580
3200	7.206	85.884	33.636	9117	5760
3300	7.306	89.943	35.188	9324	5940
3400	7.409	94.161	36.804	9531	6120
3500	7.514	98.506	38.484	9744	6300
3600	7.621	103.07	40.231	9954	6480
3700	7.730	107.78	42.053	10174	6660
3800	7.841	112.68	43.945	10390	6840
3900	7.953	117.77	45.910	10617	7020
4000	8.067	123.06	47.959	10843	7200
4100	8.181	128.55	50.076	11066	7380
4200	8.295	134.22	52.273	11302	7560
4300	8.407	140.08	54.539	11539	7740
4400	8.519	146.14	56.876	11778	7920
4500	8.629	152.39	59.285	12018	8100
4600	8.737	158.82	61.767	12257	8280
4700	8.844	165.38	64.307	12503	8460
4800	8.947	172.13	66.919	12749	8640
4900	9.050	179.03	69.599	12992	8820
5000	9.151	186.17	72.364	13245	9000

Table 1510.15 SHOCK FRONT CONDITIONS for dry air (Continued)

ρ_1/ρ_o = 0.008 T_1 = 175°K					
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	4.015	.05882	3.8378	2746.1	900
1000	5.279	.15470	8.1394	4413	1800
1500	5.940	.26111	12.986	5351	2700
2000	6.435	.37727	18.344	6814	3600
2500	7.019	.51669	24.910	7930	4500
3000	8.082	.73106	35.339	9344	5400

ρ_1/ρ_o = 0.008 T_1 = 500°K					
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	1.000	.01465	3.8378	1463.3	900
1000	3.428	.10045	8.1394	3573	1800
1500	4.683	.20585	12.986	5062	2700
2000	5.487	.32170	18.349	6293	3600
2500	6.271	.46176	24.964	7490	4500
3000	7.494	.67858	35.532	8989	5400

ρ_1/ρ_o = 0.04 T_1 = 175°K					
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	4.015	.29417	3.8375	2746.4	900
1000	5.278	.77350	8.1389	4413	1800
1500	5.939	1.3057	12.985	5696	2700
2000	6.426	1.8840	18.317	6811	3600
2500	6.912	2.5383	24.442	7871	4500
3000	7.612	3.3934	32.642	9042	5400

ρ_1/ρ_o = 0.04 T_1 = 500°K					
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	1.000	.07326	3.8377	1463.3	900
1000	3.428	.5024	8.1394	3573	1800
1500	4.682	1.0292	12.985	5062	2700
2000	5.477	1.6057	18.318	6286	3600
2500	6.157	2.2612	24.468	7421	4500
3000	7.003	3.1238	32.752	8665	5400

Table 1510.15 SHOCK FRONT CONDITIONS for dry air (Continued)

M	ρ_1/ρ_o = 0.2		T_1 = 175°K		
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	4.013	1.4707	3.8364	2746.4	900
1000	5.274	3.8685	8.1376	4413	1800
1500	5.932	6.5295	12.983	5699	2700
2000	6.414	9.4165	18.304	6814	3600
2500	6.854	12.592	24.228	7844	4500
3000	7.366	16.300	31.318	8891	5400

	ρ_1/ρ_o = 0.2		T_1 = 500°K		
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	1.000	.36636	3.8374	1463.6	900
1000	3.426	?.512	8.1385	3573	1800
1500	4.677	.1463	12.984	5062	2700
2000	5.467	8.0237	18.305	6286	3600
2500	6.097	11.199	24.241	7392	4500
3000	6.745	14.954	31.374	8497	5400

	ρ_1/ρ_o = 1.0		T_1 = 175°K		
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	4.004	7.3510	3.8309	2747.0	900
1000	5.249	19.350	8.1295	4416	1800
1500	5.897	32.672	12.975	5702	2700
2000	6.369	47.109	18.287	6818	3600
2500	6.782	62.794	24.123	7841	4500
3000	7.197	80.229	30.688	8829	5400

	ρ_1/ρ_o = 1.0		T_1 = 500°K		
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
500	1.000	1.8327	3.8374	1464.9	900
1000	3.417	12.57	8.1349	3579	1800
1500	4.656	25.751	12.978	5069	2700
2000	5.434	40.138	18.291	6293	3600
2500	6.034	55.804	24.130	7388	4500
3000	6.579	73.281	30.716	8428	5400

Table 1510.15 SHOCK FRONT CONDITIONS for dry air (Concluded)

ρ_1/ρ_o = 0.008 T_1 = 273.2°K					
T (°K)	ρ_2/ρ_1	P_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	1.000	.0080059	1.6225	1092.2	491.7
300	1.260	.01108	1.8302	1253.6	540
400	2.219	.02601	2.6101	1860.2	720
500	2.940	.04309	3.4031	2369.1	900
600	3.468	.06098	4.2164	2803.8	1080
700	3.877	.07953	5.0539	3191.3	1260
800	4.207	.09863	5.9168	3543	1440
900	4.484	.1183	6.8058	3871	1620
1000	4.721	.1383	7.7178	4180	1800
1100	4.929	.1589	8.6514	4472	1980
1200	5.113	.1798	9.6044	4751	2160
1300	5.279	.2011	10.579	5016	2340
1400	5.430	.2228	11.571	5272	2520
1500	5.570	.2449	12.583	5522	2700
1600	5.699	.2672	13.613	5764	2880
1700	5.822	.2901	14.668	5997	3060
1800	5.940	.3134	15.743	6227	3240
1900	6.055	.3373	16.851	6457	3420
2000	6.171	.3619	17.995	6676	3600
2100	6.288	.3873	19.186	6903	3780
2200	6.412	.4140	20.440	7129	3960
2300	6.545	.4423	21.776	7359	4140
2400	6.692	.4724	23.214	7595	4320
2500	6.857	.5053	24.788	7844	4500
2600	7.043	.5414	26.525	8100	4680
2700	7.252	.5812	28.456	8379	4860
2800	7.485	.6252	30.606	8675	5040
2900	7.743	.6741	33.005	8986	5220
3000	8.022	.7281	35.663	9321	5400
3100	8.318	.7871	38.578	9672	5580
3200	8.624	.8512	41.750	10036	5760
3300	8.936	.9200	45.167	10417	5940
3400	9.247	.9932	48.801	10801	6120
3500	9.549	1.070	52.602	11194	6300
3600	9.837	1.150	56.543	11585	6480
3700	10.11	1.231	60.582	11975	6660
3800	10.36	1.314	64.676	12359	6840
3900	10.59	1.396	68.797	12723	7020
4000	10.80	1.480	72.972	13091	7200
4100	11.00	1.566	77.183	13455	7380
4200	11.19	1.652	81.502	13806	7560
4300	11.37	1.741	85.933	14163	7740
4400	11.56	1.836	90.585	14541	7920
4500	11.75	1.933	95.508	14908	8100
4600	11.96	2.040	100.73	15305	8280
4700	12.16	2.151	106.29	15686	8460
4800	12.38	2.270	112.23	16122	8640
4900	12.60	2.397	118.61	16555	8820
5000	12.83	2.534	125.39	17018	9000

Table 1510.15 SHOCK FRONT CONDITIONS for air with 0.5 mole % moisture content

ρ_1/ρ_o = 1.0 T_1 = 273.2°K					
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	1.000	1.0001	1.6199	1092.2	491.7
300	1.261	1.385	1.8288	1253.6	540
400	2.220	3.254	2.6081	1861.9	720
500	2.935	5.385	3.3995	2370.7	900
600	3.460	7.625	4.2115	2806.8	1080
700	3.863	9.943	5.0476	3192.9	1260
800	4.190	12.33	5.9101	3547	1440
900	4.463	14.79	6.7977	3878	1620
1000	4.697	17.30	7.7093	4183	1800
1100	4.901	19.87	8.6424	4475	1980
1200	5.083	22.49	9.5963	4754	2160
1300	5.246	25.16	10.570	5023	2340
1400	5.394	27.87	11.561	5282	2520
1500	5.531	30.62	12.571	5528	2700
1600	5.658	33.43	13.600	5771	2880
1700	5.777	36.27	14.648	6004	3060
1800	5.890	39.17	15.717	6230	3240
1900	5.997	42.11	16.805	6457	3420
2000	6.101	45.11	17.916	6676	3600
2100	6.201	48.15	19.047	6890	3780
2200	6.299	51.26	20.202	7106	3960
2300	6.395	54.42	21.383	7313	4140
2400	6.489	57.65	22.590	7523	4320
2500	6.584	60.95	23.829	7730	4500
2600	6.678	64.34	25.098	7933	4680
2700	6.772	67.79	26.403	8136	4860
2800	6.867	71.34	27.744	8343	5040
2900	6.963	75.00	29.132	8547	5220
3000	7.061	78.77	30.563	8750	5400
3100	7.161	82.67	32.046	8957	5580
3200	7.262	86.68	33.581	9163	5760
3300	7.367	90.86	35.175	9373	5940
3400	7.473	95.19	36.832	9583	6120
3500	7.581	99.65	38.549	9797	6300
3600	7.690	104.3	40.337	10016	6480
3700	7.802	109.1	42.196	10236	6660
3800	7.914	114.0	44.123	10456	6840
3900	8.028	119.3	46.126	10686	7020
4000	8.141	124.7	48.207	10915	7200
4100	8.256	130.2	50.355	11145	7380
4200	8.369	135.9	52.580	11378	7560
4300	8.482	141.9	54.876	11624	7740
4400	8.586	147.8	57.196	11850	7920
4500	8.702	154.2	59.686	12093	8100
4600	8.810	160.6	62.195	12333	8280
4700	8.915	167.3	64.762	12605	8460
4800	9.018	174.1	67.410	12828	8640
4900	9.119	181.0	70.117	13071	8820
5000	9.218	188.2	72.913	13323	9000

Table 1510.15 SHOCK FRONT CONDITIONS for air with 0.5 mole % moisture content (Concluded)

ρ_1/ρ_o = 0.008 T_1 = 273.2°K					
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	1.000	.0080065	1.1823	1093.5	491.7
300	1.260	.01106	1.5906	1214.9	540
400	2.220	.02602	2.1726	1662.5	720
500	2.942	.04311	2.9651	2372.0	900
600	3.471	.06103	3.7342	2607.7	1080
700	3.881	.07962	4.5247	3195.2	1260
800	4.212	.09876	5.4021	3550	1440
900	4.482	.1182	6.3726	3875	1620
1000	4.727	.1385	7.2985	4166	1800
1100	4.936	.1591	8.2357	4476	1980
1200	5.120	.1801	9.1919	4757	2160
1300	5.286	.2014	10.169	5023	2340
1400	5.437	.2231	11.164	5282	2520
1500	5.577	.2452	12.182	5531	2700
1600	5.708	.2677	13.218	5771	2880
1700	5.832	.2906	14.279	6007	3060
1800	5.951	.3140	15.361	6240	3240
1900	6.067	.3380	16.474	6467	3420
2000	6.184	.3627	17.631	6693	3600
2100	6.304	.3884	18.835	6919	3780
2200	6.431	.4153	20.106	7142	3960
2300	6.569	.4440	21.464	7379	4140
2400	6.721	.4747	22.932	7618	4320
2500	6.892	.5082	24.543	7871	4500
2600	7.086	.5451	26.326	8133	4680
2700	7.303	.5858	28.312	8419	4860
2800	7.546	.6311	30.529	8720	5040
2900	7.814	.6814	33.003	9042	5220
3000	8.103	.7369	35.743	9383	5400
3100	8.407	.7976	38.745	9738	5580
3200	8.720	.8631	42.003	10112	5760
3300	9.037	.9335	45.500	10492	5940
3400	9.353	1.008	49.220	10886	6120
3500	9.656	1.086	53.097	11283	6300
3600	9.945	1.167	57.110	11676	6480
3700	10.22	1.249	61.222	12064	6660
3800	10.47	1.334	65.392	12457	6840
3900	10.69	1.417	69.576	12825	7020
4000	10.90	1.502	73.819	13192	7200
4100	11.10	1.589	78.083	13560	7380
4200	11.29	1.678	82.452	13924	7560
4300	11.47	1.767	86.947	14281	7740
4400	11.65	1.861	91.621	14646	7920
4500	11.84	1.960	96.566	15020	8100
4600	12.04	2.066	101.81	15417	8280
4700	12.24	2.176	107.39	15807	8460
4800	12.45	2.296	113.36	16224	8640
4900	12.67	2.425	119.74	16667	8820
5000	12.89	2.559	126.54	17106	9000

Table 1510.15 SHOCK FRONT CONDITIONS for air with 1.0 mole % moisture content

ρ_1/ρ_o = 1.0 T_1 = 273.2°K					
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	1.000	1.0001	1.1794	1093.2	491.7
300	1.262	1.386	1.3869	1254.6	540
400	2.222	3.257	2.1708	1864.2	720
500	2.938	5.389	2.9646	2373.7	900
600	3.463	7.633	3.7792	2810.0	1080
700	3.867	9.952	4.6175	3198.2	1260
800	4.194	12.34	5.4827	3550	1440
900	4.468	14.80	6.3753	3878	1620
1000	4.702	17.32	7.2882	4190	1800
1100	4.908	19.90	8.2249	4482	1980
1200	5.089	22.52	9.1828	4764	2160
1300	5.254	25.19	10.161	5030	2340
1400	5.402	27.90	11.154	5289	2520
1500	5.539	30.67	12.170	5538	2700
1600	5.666	33.47	13.204	5778	2880
1700	5.786	36.33	14.257	6014	3060
1800	5.899	39.23	15.329	6243	3240
1900	6.007	42.18	16.422	6470	3420
2000	6.112	45.19	17.540	6690	3600
2100	6.213	48.25	18.679	6906	3780
2200	6.312	51.36	19.841	7116	3960
2300	6.409	54.54	21.032	7329	4140
2400	6.505	57.79	22.251	7539	4320
2500	6.601	61.12	23.503	7746	4500
2600	6.697	64.52	24.786	7953	4680
2700	6.794	68.02	26.107	8159	4860
2800	6.891	71.61	27.467	8363	5040
2900	6.991	75.32	28.874	8570	5220
3000	7.091	79.14	30.332	8776	5400
3100	7.194	83.09	31.842	8983	5580
3200	7.299	87.17	33.405	9196	5760
3300	7.406	91.41	35.030	9406	5940
3400	7.516	95.81	36.723	9619	6120
3500	7.628	100.4	38.479	9842	6300
3600	7.740	105.1	40.303	10059	6480
3700	7.855	110.0	42.204	10282	6660
3800	7.970	115.1	44.173	10509	6840
3900	8.086	120.4	46.216	10738	7020
4000	8.202	125.8	48.337	10971	7200
4100	8.318	131.4	50.526	11207	7380
4200	8.432	137.2	52.791	11440	7560
4300	8.546	143.3	55.129	11683	7740
4400	8.657	149.4	57.534	11919	7920
4500	8.768	155.7	60.015	12162	8100
4600	8.875	162.3	62.555	12403	8280
4700	8.981	169.0	65.167	12651	8460
4800	9.084	175.9	67.842	12900	8640
4900	9.184	182.9	70.589	13143	8820
5000	9.283	190.2	73.422	13399	9000

Table 1510.15 SHOCK FRONT CONDITIONS for air with 1.0 mole % moisture content (Concluded)

ρ_1/ρ_o = 0.008 T_1 = 273.2°K

T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	1.000	.008007	-2.4026	1098.4	491.7
300	1.263	.01110	-2.1889	1262.5	540
400	2.234	.02620	-1.3872	1880.6	720
500	2.963	.04341	- .5718	2396.0	900
600	3.498	.06150	.2653	2836.6	1080
700	3.913	.08029	1.1295	3229.7	1260
800	4.244	.09952	2.0141	3586	1440
900	4.532	.1195	2.9404	3921	1620
1000	4.771	.1398	3.8772	4232	1800
1100	4.982	.1606	4.8405	4531	1980
1200	5.171	.1819	5.8290	4813	2160
1300	5.342	.2036	6.8387	5085	2340
1400	5.495	.2255	7.8628	5344	2520
1500	5.638	.2479	8.9104	5597	2700
1600	5.773	.2708	9.9831	5846	2880
1700	5.904	.2942	11.087	6086	3060
1800	6.029	.3181	12.218	6322	3240
1900	6.152	.3427	13.383	6552	3420
2000	6.280	.3684	14.606	6785	3600
2100	6.411	.3951	15.884	7021	3780
2200	6.553	.4235	17.251	7257	3960
2300	6.710	.4540	18.725	7503	4140
2400	6.886	.4871	20.344	7759	4320
2500	7.087	.5237	22.143	8031	4500
2600	7.314	.5644	24.156	8320	4680
2700	7.574	.6102	26.433	8635	4860
2800	7.865	.6616	29.006	8970	5040
2900	8.188	.7195	31.917	9331	5220
3000	8.534	.7837	35.163	9718	5400
3100	8.898	.8546	38.747	10125	5580
3200	9.270	.9317	42.657	10545	5760
3300	9.644	1.015	46.864	10991	5940
3400	10.01	1.103	51.323	11437	6120
3500	10.35	1.194	55.957	11880	6300
3600	10.67	1.288	60.731	12320	6480
3700	10.97	1.384	65.590	12753	6660
3800	11.23	1.480	70.468	13176	6840
3900	11.46	1.576	75.336	13589	7020
4000	11.67	1.673	80.187	13993	7200
4100	11.86	1.769	85.010	14377	7380
4200	12.03	1.865	89.887	14757	7560
4300	12.19	1.962	94.796	15121	7740
4400	12.35	2.063	99.836	15499	7920
4500	12.55	2.174	105.51	15905	8100
4600	12.66	2.274	110.55	16263	8280
4700	12.83	2.388	116.32	16657	8460
4800	13.00	2.510	122.43	17064	8640
4900	13.17	2.636	128.93	17477	8820
5000	13.35	2.771	135.83	17917	9000

Table 1510.15 SHOCK FRONT CONDITIONS for air with 5.0 mole % moisture content

ρ_1/ρ_o = 1.0		T_1 = 273.2°K			
T (°K)	ρ_2/ρ_1	p_2 (atm)	U_2 $\left(\frac{\text{ft-lb}_F}{\text{slug}}\right)$	u_1 $\left(\frac{\text{ft}}{\text{sec}}\right)$	T (°R)
273.2	1.000	1.0001	-2.4055	1099.4	491,7
300	1.264	1.389	-2.1909	1265.1	540
400	2.236	3.278	-1.3887	1882.2	720
500	2.960	5.431	- .5752	2396.3	900
600	3.490	7.690	.2604	2839.2	1080
700	3.897	10.03	1.1188	3231.0	1260
800	4.231	12.45	2.0109	3593	1440
900	4.507	14.93	2.9249	3921	1620
1000	4.747	17.48	3.8668	4236	1800
1100	4.957	20.09	4.8337	4534	1980
1200	5.143	22.75	5.8196	4816	2160
1300	5.308	25.45	6.8230	5089	2340
1400	5.459	28.19	7.8484	5348	2520
1500	5.602	31.02	8.9005	5604	2700
1600	5.734	33.87	9.9705	5850	2880
1700	5.857	36.77	11.060	6089	3060
1800	5.973	39.71	12.167	6322	3240
1900	6.086	42.73	13.305	6552	3420
2000	6.194	45.75	14.463	6775	3600
2100	6.301	48.93	15.652	6998	3780
2200	6.405	52.12	16.868	7218	3960
2300	6.510	55.40	18.121	7431	4140
2400	6.613	58.76	19.402	7648	4320
2500	6.717	62.21	20.725	7864	4500
2600	6.822	65.76	22.089	8077	4680
2700	6.929	69.42	23.502	8291	4860
2800	7.038	73.21	24.966	8507	5040
2900	7.150	77.14	26.488	8724	5220
3000	7.264	81.21	28.073	8944	5400
3100	7.382	85.44	29.725	9163	5580
3200	7.502	89.84	31.446	9386	5760
3300	7.627	94.44	33.249	9616	5940
3400	7.754	99.24	35.132	9846	6120
3500	7.883	104.2	37.096	10079	6300
3600	8.014	109.4	39.145	10322	6480
3700	8.148	114.9	41.288	10564	6660
3800	8.280	120.5	43.516	10807	6840
3900	8.415	126.4	45.842	11063	7020
4000	8.549	132.5	48.252	11312	7200
4100	8.679	138.7	50.738	11568	7380
4200	8.810	145.2	53.323	11824	7560
4300	8.937	151.9	55.980	12087	7740
4400	9.062	158.8	58.722	12346	7920
4500	9.184	165.9	61.546	12612	8100
4600	9.300	173.2	64.424	12874	8280
4700	9.413	180.6	67.383	13143	8460
4800	9.521	188.2	70.405	13409	8640
4900	9.626	195.9	73.494	13675	8820
5000	9.727	204.0	76.669	13950	9000

Table 1510.15 SHOCK FRONT CONDITIONS for air with 5.0 mole % moisture content (Concluded)

SECTION 15 - PROPERTIES OF GASES

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